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Managing Editor: HUGH S. POCOCK, M.I.E.E. *Technical Editor:* W. O. FENWICK, M.I.E.E.
Industrial Editor: J. H. COSENS *Technical Consultant:* C. O. BRETTELLE, M.I.E.E.

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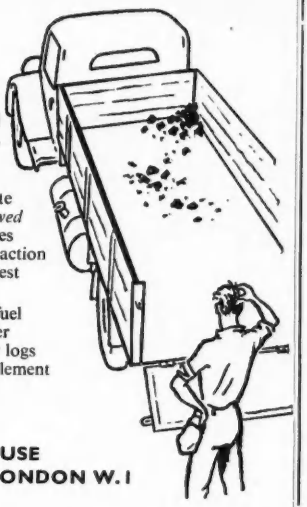

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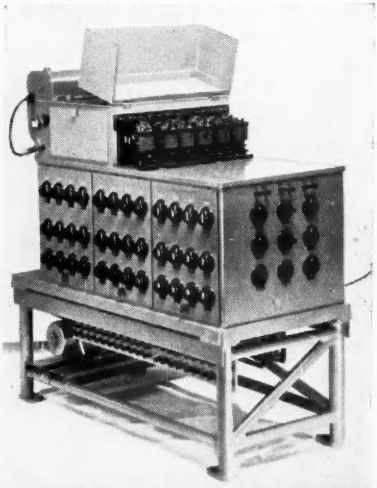

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ELECTRICAL REVIEW 5th SEPTEMBER, 1952

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Productive Electricity

THE value of the visit paid to the United States of America by the British electricity supply teams is once more made evident by the review of the action taken on their recommendations which has been issued by the Anglo-American Council on Productivity and is summarized on a later page. The significant factor was the connection between the greater industrial output of the U.S.A. and the use of from two to three times more power per worker there than in Great Britain. Although practices successful in America may not all be applicable to conditions in this country, there are many (chiefly concerning details) that deserve the close attention the document shows them to have received from the British Electricity Authority, the Area Boards and the Joint Advisory Councils.

Some of the methods advocated were already in use here, though often in a tentative way or on a scale that is limited by present restrictions on capital expenditure or by non-availability of essential supplies. Others, of no less merit because they serve as guides to future rather than immediate possibilities here, present opportunities for testing technical projects in the light of operational experience, information on which was frankly and generously placed at the disposal of the teams.

Difficulties in Britain are not always within the control of the electricity supply industry. One which does not inhibit progress in the U.S.A. is the time lag (during which important technical developments may take place) between the design of a power station and its commissioning, in so far as these delays are due to the frequently long-drawn-out procedure legally requisite before Ministerial consent can be obtained. As a result of representations, seemingly based on lessons of the report, a more realistic approach is now being made to this problem.

Much has been learned about maintenance methods, particularly in the reduction of periods in which plant is out of service for overhaul

or repairs. In this work the provision of mobile power on the job has been a notable factor at a cost that is small compared with that of having efficient plant out of service and the consequent risk to continuity of supply. Considerable as have been the mutual gains from interchange of views on technicalities and organization, it is probable that the stimulus to thought they have been given will prove a no less important outcome of the visit.

ATOMIC ENGINEERING

The announcement that the Ministry of Supply is engaging engineers of professional standing in connection with the design and development of atomic power plant presumably marks the beginning of a new stage. Physicists are no doubt satisfied that their own work on heat transfer, low neutron absorption materials and so on is far enough advanced to permit of its being given practical shape in pilot plants that will indicate technical possibilities of steam or gas production rather than of generation on a commercial scale. That, according to informed opinion, is not to be expected for some years.

GENERATOR USAGE

It is of practical advantage to know how the " best possible " utilization of a steam turbo-alternator will vary when either the terminal voltage or the load power factor differs from the machine's rated values. The employment of a graphical method, taking saturation into account, for obtaining this information is explained on another page. The investigation is summarized diagrammatically—the essence of the article—to illustrate the governing laws. The concluding study of the practical case with reactance (in the form of a step-up transformer) introduced between the machine's terminals and its load is intended to indicate (a) how an alternator should be rated to satisfy the load requirements and (b) what are the utilization limitations of a given generator, designed to carry load directly on its terminals, when additional reactance is interposed.

ELECTRIC HEATING

The latest counterblast to the attacks on electricity has come from Dr. P. Dunsheath, president of the Electrical Development Association. It appeared in the *Financial Times* last week in two long instalments as " The Case for Electricity." Dr. Dunsheath was concerned particularly with electric heating and drew attention to a number of " awkward points " which opponents of electricity are liable to skate over. Hardly had Dr. Dunsheath's article been published when the *Observer* came out with a repetition of the case for solid fuel appliances against electric heating. The necessity for the continuance of the power station programme was admitted, but for industrial power and lighting only it was implied. Nothing was said about the probable cost of electricity for power alone if there were no off-peak load to take up the slack—in more than one sense.

AID FOR EDITORS

Most trade journals endeavour to help their readers by indicating in advance what they may see at exhibitions arranged by their respective industries. This means that they have to ask exhibitors what they are showing. What the editors want, of course, is notes of exhibits of particular interest. More often than not what they get is a large bundle of catalogues, lengthy specifications and general advertising matter. Some unfortunate sub-editor has to dig out from this mass the information which he thinks the reader wants. For this reason we commend the action of the Society of Motor Manufacturers and Traders which has advised those of its members exhibiting at the forthcoming Motor Show to send the Press summarized descriptions of their displays in " an easily and quickly assimilable form."

Synchronous Generators

Operation at Voltages and Power Factors Differing from the Rated Values

By W. SZWANDER, Dipl.Ing., M.I.Mech.E., M.I.E.E.*

IT is the usual practice to specify generators with a rated voltage equal to the nominal voltage of the system to which they will be directly connected. With the MW rating of a generator determined by the size of the driving turbine and with the power-factor rating selected to suit the load requirements and the proposed method of system operation, the generator MVA rating is fixed. The latter then represents the main factor which determines the frame size of the machine (at a pre-selected speed of rotation, of course). The corresponding generator stator and rotor current ratings are obtained taking into account the fixed terminal voltage rating, and the magnetic characteristics of the machine.

Voltage Variations

In the majority of power systems the requirements of voltage regulation make it necessary to vary the voltage at the generator terminals according to the fluctuations of the system load, the higher generated voltages being required at times of higher loads. This results in practically all generators operating at times with terminal voltages in excess of the rated values, a tacit assumption usually being made that generators can safely work with a terminal voltage increased by approximately 5 per cent above the rated value. Freedom from operational troubles justifies this assumption. It is, however, worth investigating the subject more in detail, particularly should the need arise to exceed the rated voltage by more than 5 per cent, or should it become necessary to operate at voltages lower than the rated values (e.g., should the possibility of adjusting taps on system transformers allow the required range of generator voltage adjustment exceeding 5 per cent to be kept below the 105 per cent level of the generator rated voltage).

In some instances generators are specified as capable of delivering the full rated MVA at two limiting voltages (the rated voltage being described as: x $\pm$ y per cent). This may tend to increase the cost, as the generator frame size is determined by the maximum stator current occurring at the lower voltage jointly with the maximum rotor current corresponding to the higher voltage. It will be shown, however, that such additional expenditure is not always justified because an increase of the voltage above its rated value, when kept within reasonable limits, results only in an insignificant increase of the rotor current.

The operation of generators at increased voltages presents two problems. One is the increased electrical stressing of the winding insulation. The latter, however, must in any case be designed with large safety factors to allow for the imperfections of materials and of workmanship, and to enable it to withstand system surges even after a period of ageing corresponding to the length of useful life of the machine. Therefore such a small increase of the working voltage as say 5 per cent above the rating cannot cause any anxiety. It is possible that in cases of generators wound for 22 or 33 kV, the insulation safety margins of which must necessarily be somewhat reduced, more caution may be advisable, particularly when exceeding the 105 per cent value of the rated voltage, or when the insulation is normally exposed to frequent system surges of atmospheric origin, or when generators work in systems using Petersen coils in the neutral, in which case the voltage increase of the healthy phases above earth potential is a frequent occurrence. Even in the case of 33 kV

* Chief Technical Assistant, Belfast Corporation Electricity Department.

generators, however, their designers do not object in principle to operation at voltages up to 5 per cent above the rated value.

The second problem calling for attention is the need not to exceed the maximum rated values of the generator stator and rotor currents, when working at terminal voltages differing from the rated values. It is appreciated that operation at voltages and/or power factors differing considerably from those rated introduces additional output restrictions due to changes of the magnitude and distribution of the losses; this factor can be disregarded, however, when such deviations from ratings are kept within comparatively narrow limits.

The most convenient method of investigating these phenomena is by means of a vector diagram of the magnetizing ampere-turns (or excitation current) and it will be illustrated by the example of a 3,000 r.p.m., 30 MW, 35·3 MVA, 0·85 p.f. 33 kV generator: its no-load and short-circuit characteristics are shown in Fig. 1. In studies of this nature the saturation effect is very often neglected for simplicity, and the air-gap line is used instead of the actual no-load characteristic of the generator. A preliminary check indicated that in the case under consideration such a simplification would considerably falsify the results. Therefore a more accurate method of determining the machine excitation, with due regard for saturation, has been used.

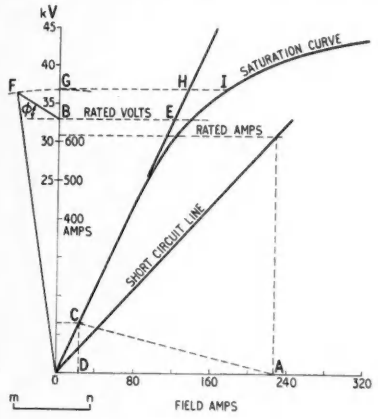

Fig. 1—Short-circuit and saturation characteristics of a 30 MW, 35.3 MVA, 33 kV, 3,000 r.p.m. generator

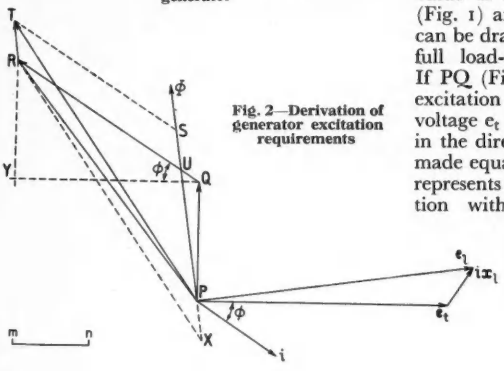

Fig. 2—Derivation of generator excitation requirements

In the basic vector diagram of the generator (Fig. 2—stator winding resistance neglected) e_t represents the terminal voltage and e_1 represents the voltage developed by the air-gap flux Φ (leading e_1 by 90 deg) while e_1 is obtained from e_t by adding to the latter the voltage drop produced by the stator current i in the armature leakage reactance x_1. With sufficient accuracy for x_1 the well-known Potier reactance x_p can be used. The latter can be determined if, in addition to the no-load and short-circuit characteristics of the generator, also one point at least of a reactive zero power factor saturation curve is known. In the absence of such information a satisfactory approximation (for turbo type generators) is to take for the Potier reactance a figure equal to the mean value of the subtransient and the transient reactance (for the generator used in this example $x_p = \frac{1}{2}(16{\cdot}9 + 22) = 19{\cdot}45$ per cent). The known value of $x_1 i = x_p i$ can be shown as DC (Fig. 1) and then the Potier triangle OAC can be drawn on the base OA, equal to the full load-current short-circuit excitation. If PQ (Fig. 2) represents the air-gap line excitation corresponding to the terminal voltage e_t (BE in Fig. 1) and QR is drawn in the direction of the stator current i and made equal to OA (from Fig. 1) then PR represents the value of the full load excitation with saturation neglected. From geometrical relations (OB $= e_t$, BF $=$ CD $= ix_1 = ix_p$, OF $=$ OG $= e_1$, GH: BE $=$ OG : OB $= e_1 : e_t$, PU : PQ $= e_1 : e_t$, PU : PQ $=$ GH : BE, PQ $=$ BE, hence PU $=$ GH) it will be seen that PU represents

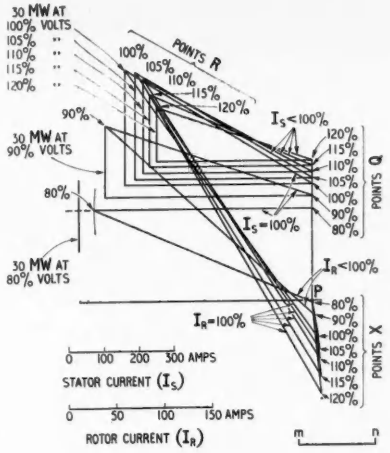

Fig. 3—Graphical analysis of generator performance at various terminal voltages

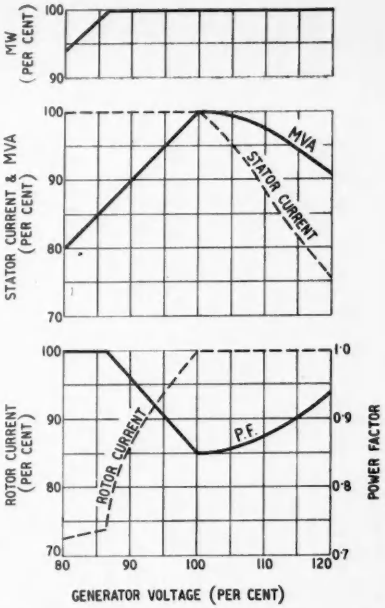

Fig. 4—Typical generator performance curves for maximum utilization at varying terminal voltage

the air-gap line excitation corresponding to the actual flux Φ developing the voltage e_1.

In view of the presence of the saturation effect a larger excitation is actually required to produce the necessary flux Φ, namely that equal to PS, equal to GI (Fig. 1). The saturation correction HI = US = TR must be added in the direction of PU to obtain the final true value of the full load excitation current PT. The component UR = ST = AD represents the field ampere-turns, or excitation, compensating the demagnetizing effect of the stator current and as such, does not produce a flux and therefore is not influenced by saturation. It is worth noting that, by definition, the ratio QR: QP represents the non-saturated value of the synchronous reactance of the generator. It is immaterial in which sequence the vectors resulting in the final value of PT are added. For convenience of the present investigation the load excitation value XR = PT will be obtained as PQ (air gap excitation for the terminal voltage value) plus (geometrically) QR (full load current short circuit excitation properly corrected, if the current deviates from its full load value) plus the saturation correction PX obtained like HI (in Fig. 1) and drawn in the direction of OF.

On the vector diagram (in Fig. 2) PQ, QR and XR represent (in various scales) the terminal voltage, the stator current and the rotor current of the generator. Further, QY is a projection of the stator current QR (with the angle RQY equal the load current angle ϕ) and represents in still another scale the active power output of the machine. The scale of the latter will vary, of course, with any change of the terminal voltage. The derived form of the vector diagram can be used conveniently to analyse the working conditions of a generator at various terminal voltages. This kind of analysis has been made and a number of vector diagrams obtained are reproduced in Fig. 3. At voltages above the nominal, the limiting factor is the rotor current. For each case the working point (hence the stator current and the power factor) is obtained as a section of the vertical line drawn for the full 100 per cent (30 MW) of the output (scale corrected each time to account for the change of voltage) with the circle drawn from point X (see Fig. 2) with a radius equal to the nominal rotor current which cannot be exceeded. It should be noted that the position of the point X (which

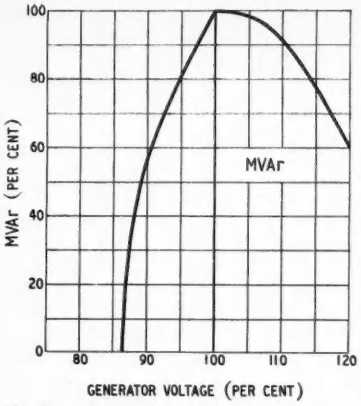

Fig. 5—Generator reactive output associated with maximum possible active load, with terminal voltage variation

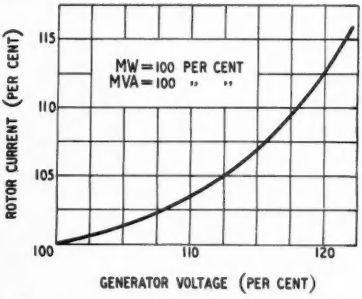

Fig. 6—Rotor current as a function of generator terminal voltage, with maintained full rated output of the machine

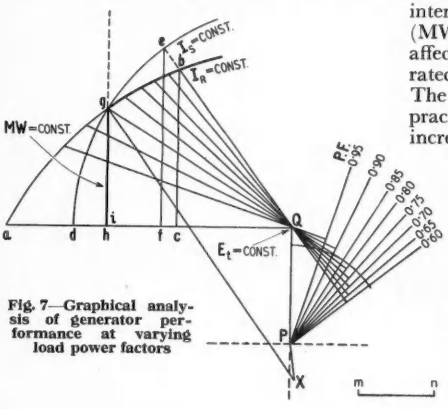

Fig. 7—Graphical analysis of generator performance at varying load power factors

depends on both the stator current and the power factor) can be found each time only by applying a step-by-step method, repeating several times the construction of the vector diagram till the required degree of accuracy is reached. It is interesting to note, however, that the direction of PX, along which the saturation corrections have to be measured, does not deviate much from this direction for the 100 per cent terminal voltage value. At 80 per cent voltage the saturation correction is negligible, whereas at 120 per cent voltage it is more than twice as great as for the nominal voltage.

For voltages below the nominal the stator current becomes the limiting factor, the maximum utilization working point (R) being determined by the cross-section of the 100 per cent MW output line and a circle representing the 100 per cent stator current, drawn round the point Q. The working point determines the rotor current XR and the power factor angle RQY. Once the p.f. reaches unity the full 100 per cent of the output (30 MW) cannot be reached with any further reduction of the terminal voltage; the position of the point R must be determined on a horizontal line QR, this giving the maximum possible output with unity p.f. and full stator current.

The results of such an analysis of the maximum possible utilization of a generator with varying terminal voltage are summarized graphically (Figs. 4 and 5) and are self-explanatory. They apply quantitatively to the generator used for the investigation, but are qualitatively typical for all generators of similar type. It is interesting to note how the generator output (MW, MVAr, p.f.) is much more rapidly affected by the voltage being below the rated value than when the latter is exceeded. The most important conclusion, from a practical viewpoint, is that with a small increase of the terminal voltage, not exceeding say 5 per cent, the changes in the MVA, MVAr and p.f. are negligible and the generator can be operated under such conditions at its rated MW, MVA and p.f. without danger of the rotor overheating. The actual rotor currents corresponding to the excessive terminal voltages, if full nominal MW and MVA outputs are maintained, can easily be derived from vector diagrams similar to those in Fig. 3; the results of such an

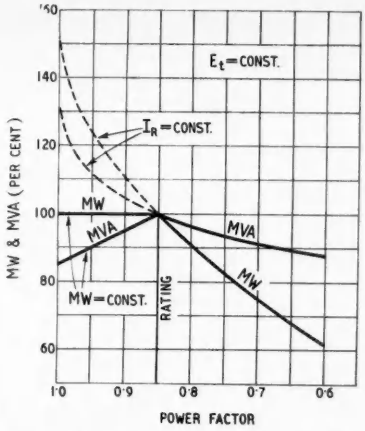

Fig. 8—Typical performance curves for generator maximum utilization, at constant terminal voltage and with varying load power factor

investigation are shown in Fig. 6, which indicates that there is not any serious danger of overheating the rotor even when the terminal voltage is raised to 110 per cent.

Power Factor Variations

The same method of investigation can be used to determine the limits of operation of a generator when its p.f. deviates from the rated value, the terminal voltage remaining constant. A corresponding set of vector diagrams is represented in Fig. 7 (in this case one value only of the saturation correction vector PX is used corresponding to the rated conditions, its changes due to variations of the p.f. and of the stator current magnitude being comparatively insignificant). The MVA, MVAr and MW outputs of the generator at various p.f. derived from the vector diagrams in Fig. 7 are represented as graphs in Figs. 8, 9 and 10. Of the three factors (stator current, rotor current and MW output) always that one becomes the limiting factor (and determines the maximum utilization of the generator) which first reaches its permissible maximum, i.e., its rated value. Thus (see Fig. 7) for p.f. below the nominal, the rotor current is the limiting factor, and the working points corresponding to the highest machine utilization are on the circle gb. For p.f. above the nominal, the MW output becomes the limiting factor and the working points are on the straight line gh.

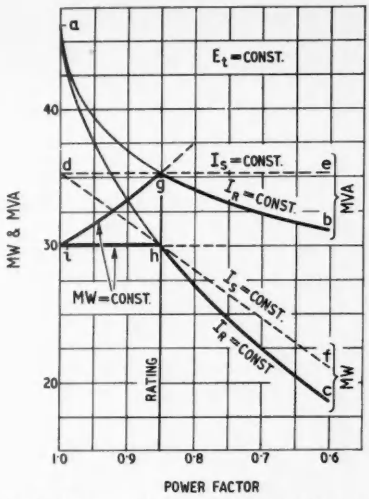

Fig. 9—Generator maximum MW and MVA outputs at varying load power factors

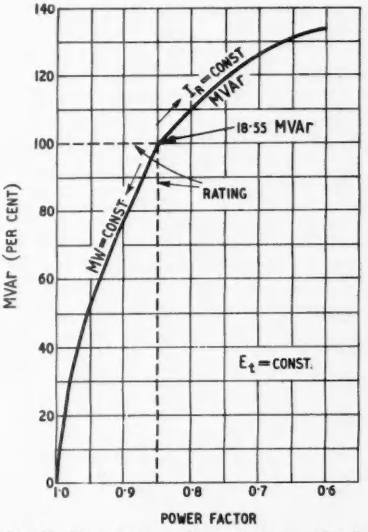

Fig. 10—Generator reactive output associated with maximum possible active load, with varying load power factors

In Fig. 9 ab and ac represent the MVA and the MW respectively for the maximum rotor current value; similarly de and df for the maximum stator current and,

finally, ig and ih for the maximum MW output. As stated before, none of the maximum values can be exceeded; hence with a varying p.f. of the generator load the MVA output variation of the machine is indicated by the lines ig and gb and those of its MW output by ih and hc. Corresponding working points in Figs. 7 and 9 are marked with identical letters. It is instructive to note that the full MVA output of the generator (and its full stator current, of course) can be utilized only at the rated p.f., while this MVA output must be reduced for p.f. below nominal on account of the rotor current and above nominal on account of the MW output limitations. On the other hand, the MVAr output (Fig. 10) drops quickly below the rated value with p.f. larger than the nominal, but increases to values exceeding the rated value at p.f. below the nominal. Hence working with p.f. below the nominal makes it possible to increase the reactive output of the generator despite the limitation imposed by the rotor current.

Reactance between Generator and Load

This is a frequently met case, either with a fault-current limiting reactor between the generator and the load, or with a step-up transformer connected directly to the generator terminals. In such cases the known voltage, p.f., MW and MVA usually refer to the load, not to the generator terminals. As an example, let the same numerical values be used as those previously quoted when a generator directly carrying its load was considered. These values now refer to the load; additionally the reactance between the generator and the load will be known, expressed in percentages on the basis of the load rated MVA; a 10 per cent value will be used to illustrate the case.

Two questions may have to be answered. First, what should be the rating of a generator for feeding the assumed load through the given reactance? The vector diagram (Fig. 11, constructed similarly to those in Figs. 3 and 7) will give the reply. The required generator terminal voltage PQ is obtained through the addition of the load terminal voltage PQ_L (equal to the rated 33 kV) and the voltage drop across the reactance QQ_L (equal to 10 per cent of 33 kV) taken at an angle corresponding to the rated load p.f. of 0·85. Geometrical relations in the particular example result in PQ being equal 105·2 per cent of the load voltage and forming an angle with the load current corresponding to a p.f. of 0·806. Assuming the same magnetic characteristics of the generator as in the previous example (Fig. 1) the saturation correction PX, corresponding to the terminal voltage PQ, is obtained in the same way as it was in connection with Fig. 3. The generator (and load) current QR determines the MW output of the generator QY (corresponding to Qh in Fig. 7, but corrected for the difference of the generator terminal voltages) and the generator rotor current XR, which is approximately 8 per cent larger than Xg in Fig. 7. Thus the required generator must be rated at $35{\cdot}3 \times 1{\cdot}052 = 37{\cdot}2$ MVA and 0·806 p.f. (30 MW : $0{\cdot}806 = 37{\cdot}2$ MVA) with the rated voltage of $33 \times 1{\cdot}052 = 34{\cdot}8$ kV. The reduction of the p.f. and the increase of voltage account for the 8 per cent increase of the rotor current. If the reactance represents a step-up transformer, the generator current will be obtained from the load current by taking into account the ratio of transformation. The increase of the generator terminal voltage (PQ) above the load voltage (PQ_L) can be achieved in this case by a suitable alteration of the transformation ratio, at the expense of an excessive voltage at the load at times of the smaller loads.

Secondly, what service can be obtained from a given generator when a reactance is inserted between its terminals and the load? In such a case the full requirements of the load cannot be met because (Fig. 11) at the point R the rotor current XR exceeds the

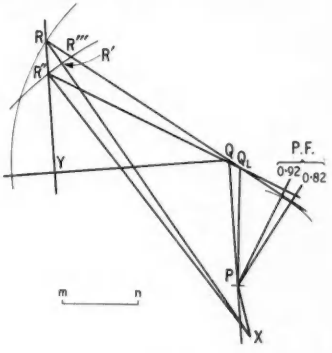

Fig. 11—Graphical analysis of the problem of a reactance connected between the load and the generator terminals

permissible rated value XR′. No accurate solution can be obtained directly without applying the step-by-step method (as in connection with Fig. 3) because any change either of the load p.f. or of the load current varies also the generator terminal voltage and hence the position of points X and Y. Not a very great error would be introduced, however, for reasonable values of reactance, if it is assumed in an approximate solution that at the point R″ both the rotor current and the generator MW output are equal to their rated values; the stator current would thus be reduced in the ratio of $R''Q_L$ to RQ_L, or to 92·5 per cent in the present example, while the load MVA would be only 32·7 MVA (instead of 35·3) which, with 30 MW, would result in a load p.f. of 0·92 instead of the rated 0·85. This represents the approximately best utilization of the generator under the given conditions; operation with the full rotor current, but at reduced p.f., would mean a reduction of the MW output below the nominal (with the working point moving along the circle R″–R –R″′ to the right from R″). The case illustrated in Fig. 11 differs from that in Fig. 3 in that the additional reactive load of the reactance is supplied by the generator, apart from the generator terminal voltage being above its rated value as a result of the voltage drop in that reactance.

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America and the Sterling Area

AN elaborately-produced volume (672 pp.), "The Sterling Area: An American Analysis," has been published by the Mutual Security Agency Mission to the United Kingdom. Copies are obtainable from H.M. Stationery Office at 21s net. The sub-title implies that the study presents the American point of view, but it has been explained that it means that the contents are limited to subject matter of special interest to people in the United States. Most of the statistical matter which forms a large proportion of the work was derived from non-American sources.

It is useful to have as a preface a world map on which are shown in different colours the sterling and dollar areas and other territories (Canada, Russia, etc.).

The study traces the development of the trade patterns of the sterling area and the economic factors which influenced them from 1945 to mid-1950. There are three main sections: the first deals with the composition, origins and growth of the sterling area; the second with each sterling area country separately; and the third with the major commodities forming the trade between dollar and sterling countries.

The 50-page section on the United Kingdom is a sympathetic survey of this country's position as the result of two wars and of its endeavours to restore its economy. A great deal of statistical matter is digested in treating of many aspects of British life and work. The same is done for the Dominions.

In the commodity section it is interesting to have tables showing both British and American electrical exports during the last fifteen years. From these it is seen that while British exports rose from an annual average of £12·1 million net in 1934–38 to £120·7 million in 1949–50 American electrical exports increased from $89·6 million to $405·7 million (the peak was $507·3 million in 1948).

It is difficult to review such a volume adequately. All that can be said is that it contains so much useful matter as to make it an essential work of reference to Britons as well as Americans.

Rubber Statistics

FIGURES published by the Secretariat of the International Rubber Study Group show that the production of natural rubber in the first half of this year was 847,500 long tons while consumption was 737,500 long tons. It is estimated that stocks at the end of June were 97,500 tons below the level at 1st January. Production of synthetic rubber for the half-year is put at 468,000 tons and consumption at 442,500 tons, stocks being 30,000 tons higher at the end of June than at 1st January.

Radio and Television Show

Trends Revealed at Earls Court

By W. E. MILLER, M.A., M.Brit.I.R.E.

A TOUR round the 19th National Radio and Television Exhibition, which opened at Earls Court, London, last week, and closes to-morrow (Saturday) reveals no startling innovations in radio and television receiver design or presentation, but nevertheless the show is probably the brightest and most interesting of the post-war series. This is the second year it has been held at Earls Court, and the Radio Industry Council, the organizers, have profited by last year's experience, and have staged a display which has much to interest the general public and, indeed, the technician.

Apart from about a hundred commercial exhibitors who are displaying their latest models in attractive and colourful settings, with many moving and eye-catching devices, the show is supported to the full by the British Broadcasting Corporation, the Navy, Army and Air Force, certain technical colleges and similar organizations.

The B.B.C. is staging in a large studio, with an auditorium holding 1,000 people, various television and radio shows which the public can witness. The studio, specially built by the R.I. Council, is probably the largest ever constructed for an exhibition. In addition, on a large stand, the B.B.C. is interviewing, recording and televising visitors, demonstrating radio sound "effects," and showing new portable equipment for outside broadcasts.

The Royal Navy is demonstrating electronic fire control for guns, a submarine radar and wireless office, convoy protection, a simple electronic computer, servo-mechanisms and other interesting electronic experiments. On the Army stand the R.E.M.E. has a number of demonstrations, including a model gun site with the latest radar and predictor at work, while the Royal Corps of Signals exhibits the latest Army radio sets. The R.A.F. exhibit includes a demonstration of remote radio-controlled flying aircraft, an R.A.F. signals office, and the training of young apprentices, who are seen constructing radio receivers.

The composite technical training exhibit, arranged by several well-known colleges, indicates the opportunities for training for radio and electronic work which now exist. Many of the interesting experiments carried

out by students are set up and can be examined.

Among the other electronic exhibits of general interest is the G.P.O. television detector van, a meteorological display showing the use of the radio sonde, a two-way television-telephone working between two stands, a remotely controlled television camera, deep sea television cameras, an electronic altimeter, an electronic stencil cutting machine, a radio heater which is hardening steel, and a mobile television aerial research unit.

It will be seen, therefore, that an attempt is being made to emphasize to the public the uses of radio, television and electronics in the Services and in industry apart from the home entertainment angle with which the Show is, of course, mainly concerned.

Turning to the commercial exhibits, it is natural that once again television reception is prominently featured on the stands of the thirty-six television set makers at the Show. Since the war there has been a gradual tendency towards the use of larger tubes in direct-view receivers. The 9in tube has practically died out; in fact, there are only two receivers in the Show employing tubes of this size, and these are naturally the lowest-priced models, one selling at only £45.

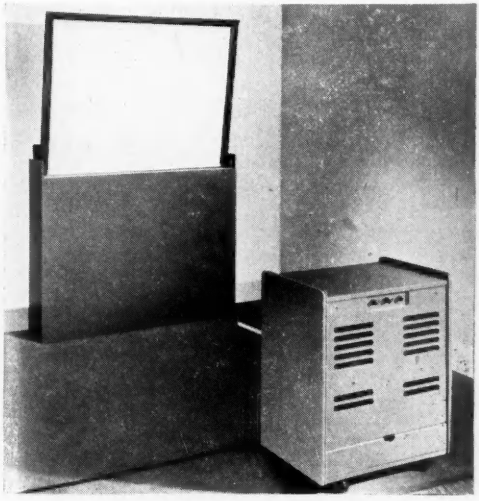
Last year the most popular tube size was 12in, and this is still the case, but the present exhibition reveals the fact that larger tubes are being employed in many of the new models, and it seems that they will soon become the new standard, with the 12in models classed as "small."

Tubes with rectangular screens, which made their first appearance last year, are now to be seen in much larger numbers. The two popular types have screens measuring diagonally 14in and 17in respectively. In addition, 15in and 16in circular screen tubes are widely used, many of the latter being of the metal cone type with a circular glass faceplate.

"Ion burn," which manifested itself in older tubes as a circular dark patch on the screen after a period of use, has been completely eliminated in the latest models, either by built-in or external "ion traps," or by the aluminizing of the screen coating. Most modern tubes are now of the "wide angle" type, in which the electron beam is deflected through an angle of 70 deg, so that the tube length is reduced for a given screen size, permitting shallower cabinets to be employed.

A new development in some tubes is the use of a tinted glass for the tube face, eliminating the need for an external filter. This, besides enabling the picture to be viewed with good contrast in a reasonably well-lighted room, also reduces halation effects.

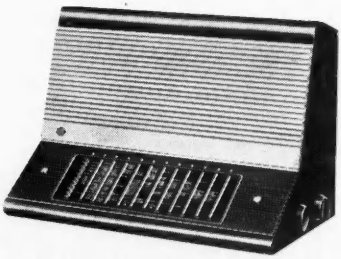
This year more manufacturers have turned



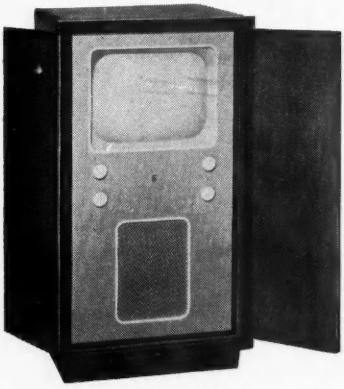
Portable radio-gramophone (A. J Balcombe, Ltd.) which operates from mains or dry batteries; the motor is spring driven

Left: **Decca front-projection T.V. receiver suitable for clubs or large lounges (4ft by 3ft picture)**

Table radiograms are popular for small homes. This model is the McCarthy (Felgate Radio) with a three-speed automatic changer



This Pye table radio receiver, in its cabinet of striking contemporary style, incorporates eleven wavebands



A neat direct-view television console by Philips Electrical. A 14in rectangular flat-faced tube is used, and the doors fold back flat with the sides of the cabinet

their attention to projection television. The basis of all these models is the 2½in projection tube with the Schmidt optical system. Domestic models in cabinets usually employ "back-projection" on to a translucent screen of special design which concentrates the available light in a solid angle roughly coinciding with normal viewing positions. Larger models, some using front projection on to a separate screen, give pictures up to 4ft by 3ft.

Since the projection system was first introduced three or four years ago, the brightness of the picture has been very appreciably increased, so that most back-projection models can now be comfortably viewed in reasonable room lighting. Improved tubes and screen are largely responsible for this.

Though the smallest projected pictures are not much larger than the largest modern direct-view pictures, the projection system has an obvious advantage where a picture, say, 20in wide is desired. A direct-view tube 25in in diameter would be required for this. Lower cost of tube replacement is another big advantage on the side of projection systems.

The circuitry of television receivers in general has been improved in detail. It is rare to-day to encounter a set in which the lines do not interlace correctly, while interference filters, both for vision and sound, have been improved. Several manufacturers this year have introduced improved line scan circuits, variously named. In principle they are similar, and enable the receiver to hold its line synchronization accurately even if the sync. pulses are momentarily lost through bad interference, or otherwise.

This feature is particularly valuable in the so-called "fringe" areas, where the signal-to-interference ratio may be relatively low. An ordinary receiver in such localities tends to give a "ragged" picture due to the partial and irregular displacement of the individual lines in each frame. Most modern receivers, too, are readily adjustable to receive any of the five main B.B.C. transmitters now in use, each of which operates on a different frequency in the 41 to 68 Mc/s band.

During the past year some development has taken place in the design of television aerials for use in areas where signal reflections are encountered. In certain districts in the Holme Moss service area, for instance,

reflections are introduced due to nearby hills, and the effect in the receiver is to produce a double image. By the use of special aerial arrays, accurately orientated, it is possible to reduce these reflections to a negligible value. Examples of such aerial systems are to be seen at the Show.

Although it is common practice to use a pre-amplifier between the aerial and the T.V. receiver in areas of low signal strength, it is now possible to have the amplifier on the mast-head, the power supply being fed to it by a cable running up the mast. The amplified signal then reaches the receiver via the feeder and any interference picked up on the feeder is not amplified.

Although television occupies an important position in the Show, it must not be forgotten that radio sets, radiograms and car radio receivers are still important products of the industry. In the past year supplies to the home market numbered 1,347,000 units, with 590,000 for export. Television production for the home market was about 712,000.

Changes in radio receiver design have been very slight since the last exhibition. In fact, technical design appears to have reached a standard which is not altering appreciably. It seems that only a new system of transmission, such as v.h.f., which at present cannot be embarked upon by the B.B.C. owing to Government restriction, is likely to affect receiver design to any great extent in the future.

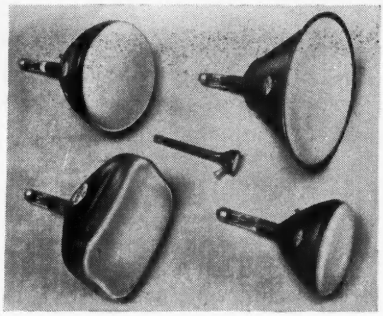
There is, however, a distinct tendency towards the production of receivers of a higher quality of reproduction than that of the average table model. In most cases the so-called " high fidelity " models are in radio-gramophone form; in other cases record players, radio units, amplifiers and the special loudspeaker unit, are obtainable separately. One firm is demonstrating high fidelity stereophonic reproduction, and others are showing reproducer units which are capable of dealing faithfully with the best of existing B.B.C. transmissions, and with the latest gramophone recordings.

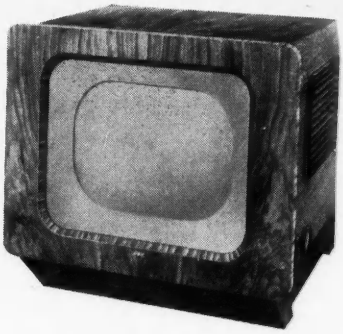
Tape recorders, too, are well in evidence this year, and here again the quality of reproduction secured is much better than in earlier models. The popularity of the existing 33⅓ r.p.m. long playing records, and the forthcoming introduction of 33⅓ and 45 r.p.m. discs by another large organization, has resulted in the fitting of three-speed record playing mechanisms in the

Example of a modern table radio receiver—the Murphy A182

Magnetic tape recorders are exemplified by this modern type shown by Simon Sound Service

Ferranti rear-projection television in console cabinet form (picture size, 15in by 11in)





Left: **Examples of the various types of television tubes made by Mullard, Ltd. That in the centre is the projection model.** *Right:* **One of a range of six G.E.C. television receivers: 12in table model BT5146**

majority of radio-gramophones. Table and portable radiograms are still increasing in popularity, and one innovation is a portable model which operates from mains or self-contained dry batteries and incorporates a spring-driven motor. Gramophone pick-ups, whether fitted to a complete record player or sold separately, are now mainly of the piezo-crystal cartridge type. Separate units are commonly used for the normal 78 and the 33⅓ r.p.m. records, but in several cases dual " turnover " types are available, which avoid the necessity of changing from one unit to the other for the two types of record.

The trend towards " miniaturization " of valves and components continues, and this year, in general, the size of the chassis of most new receivers has been reduced. Despite this, the efficiency and durability of the components used are better than those of their larger counterparts of some years ago. Really high precision enters into the construction of many modern components, while the use of special magnetic and other materials helps in keeping down the size yet maintaining high performance.

Many manufacturers show attractive small receivers, readily portable from room to room, or, in the case of those fitted with batteries, out of doors. Battery (and mains/battery) operated sets employ almost exclusively dry batteries for l.t. and h.t., and there is hardly an accumulator-operated receiver to be seen. This is largely because modern low-consumption valves, with their filaments grouped in series, can be operated economically from dry cells of reasonable size. One minor result of this is that the radio accumulator charger, for the home or the charging station, is not now in great demand.

Loudspeakers also show a trend towards smaller size, partly due to the fact that small radio receivers and table model television receivers cannot accommodate large speaker units. Quality of reproduction, despite this, tends to improve year by year, and a modern 6in diameter unit, properly mounted, can give a performance in sensitivity and quality better than that of 10in models of some years ago.

High fidelity reproducers often use two or more loudspeaker units of different sizes, with a cross-over filter. One new model, for example, uses a 12in and a 5in units, dealing respectively with the bass and treble, with a cross-over frequency of 1,000 c/s.

Although the use of plastics in the manufacture of complete cabinets, or cabinet " trimmings," continues, several set makers are reverting to highly polished wooden cabinets, even for their smaller models. For many parts of receivers or radiograms (for example, pick-up arms) plastics have entirely superseded other materials.

Price reductions have been announced for many radio and television receivers, ranging from two or three guineas for small sets to 30 guineas for some large models. In the main, the reductions have been made on existing models and not on new sets. It must be remembered that purchase tax at 66⅔ per cent is usually included in all prices. Taking this off, the basic price of a radio or television receiver compares very favourably with similar pre-war models, where they existed.

VIEWS on the NEWS

By REFLECTOR

SEEING Miss Pat Hornsby-Smith at the opening of the new Morphy-Richards factory last week I was reminded that her eloquent remarks were by no means her first "electrical" speech. In fact she graduated in the electrical industry and started on a road which led her to Parliament and a ministerial appointment. Before the war, in 1938 to be exact, Miss Hornsby-Smith (then with Central London Electricity, Ltd.) was awarded the first prize in the Electrical Development Association's Public Speaking Competition. After hearing her last week I am confident that she can still be relied on to speak up for electricity when occasion demands.

* * *

Russian statements on aims and achievements are never very clear-cut but their confusion is intensified, electrically at least, by the inability of our lay Press correspondents to comprehend figures of generating capacity and output. For instance, the latest plan published by the Soviet authorities is said to aim at 162 million kilowatt-hours for 1955. In the meantime thermal generating capacity is to be doubled and hydro-electric capacity trebled. As the present daily output of the B.E.A. is something like 130 million kWh the Russian aim does not seem to be very ambitious. And the figure cannot possibly be kilowatts: what is it?

* * *

Doubts whether all the lights have been switched off at night no longer assail a Toronto resident. He has had installed a low voltage remote-control system which enables him to switch them all on or off from his bedside. Furthermore, he can operate the radio set from the kitchen, bedroom or front door; turn on the bathroom heater or start the coffee percolating without getting out of bed and do innumerable other things. Even with these elaborate arrangements I suppose it is still possible inadvertently to touch the wrong switch and wake up next morning to find, for instance, the coffee-pot boiled dry.

* * *

Although last week's return journey across the Atlantic in one day by a Canberra bomber was not an "electric" feat it was an English Electric one—and of course electricity had an important part to play in the aircraft. Therefore I put it on record that the double trip was done in a flying time of just under eight hours, the speed averaging 454·89 m.p.h. outwards and 605·52 m.p.h. on the homeward journey—a feat for which the pilot (Mr. R. P. Beamont) and the English Electric Co. (the constructors) have deservedly secured world-wide fame.

* * *

I see that the ironmongers are again up in arms against the sale of appliances by Electricity Boards. The North Western Board was criticized particularly at a recent ironmongers' meeting in Bolton for sending out cards inviting new consumers to let the Board's representatives advise them on electrical equipment. One member said that Electricity Boards were putting up showrooms all over the place while another said that there were too many people in the electrical trade. Electrical retailers will probably agree with this last sentiment.

* * *

Under the heading "La Vie Contemplative" a contributor to the *Tablet* says that

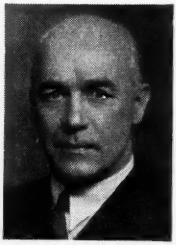
> "one of the very earliest experiments in electricity, around 1750, was made with Carthusian monks. To amuse Louis XV the Abbé Nollet spread out a number of Carthusians over a mile and connected them with a wire, along which he then discharged an electrical current, so that all the monks leaped into the air simultaneously, to the great diversion of that most Christian king."

This seems to me to have been rather long-distance transmission for those days.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced that **Mr. C. T. Melling,** M.Sc., M.I.E.E., M.I.Mech.E., has accepted the invitation of the Executive Council to become president of the Association of Supervising Electrical Engineers in succession to **Mr. T. G. N. Haldane,** M.A., M.Inst.C.E., M.I.E.E., F e l . A . I . E . E ., M.Cons.E., who is retiring after two years in office. Mr. Haldane will introduce the new president at the first meeting of the London national lecture session at the Lighting Service Bureau on 21st October.



Mr. C. T. Melling

Mr. Melling received his practical training with the B.T.H. Co., at Rugby and with the Metropolitan-Vickers Electrical Co., Ltd., at Manchester, and subsequently served as a research engineer, a design engineer, and later as a commercial engineer in the Electrical Plant Department of the latter company. He obtained experience of electricity supply with the Yorkshire Electric Power Co. and Edmundsons Electricity Corporation, Ltd., and while with Edmundsons specialized in electricity supply economics. In 1943 Mr. Melling was appointed borough electrical engineer at Luton, and on nationalization was appointed chairman of the Eastern Electricity Board. In January this year he also became a part-time member of the British Electricity Authority. He is the author of a number of papers on electricity supply economics and for a paper on "General Factors Affecting the Unification of Electricity Supply Tariffs" he was awarded the Llewelyn B. Atkinson Premium by the Institution of Electrical Engineers. He is a past chairman of the Electrical Research Association, the Utilization Section of the I.E.E., and the British Electrical Development Association.

On 29th August six leaders of the engineering profession left on the Cunard liner, *Queen Elizabeth*, for New York, to attend the centennial celebrations of the **American Society of Civil Engineers,** and a convention of engineers which opened in Chicago this week. They are Mr. W. K. Brasher, C.B.E., M.A., secretary of the Institution of Electrical Engineers, Sir David Pye, C.B., F.R.S., M.A., Sc.D., president of the Institution of Mechanical Engineers, Mr. A. S. Quartermaine, C.B.E., M.C., B.Sc., president of the Institution of Civil Engineers, Mr. E. Graham Clark, C.B.E., M.C., B.Sc., secretary of the Institution of Civil Engineers, Sir John Hacking, president of the Institution of Electrical Engineers, and Mr. B. G. Robbins, M.Sc., secretary of the Institution of Mechanical Engineers.

Mr. A. Appleyard, B.Sc., has been appointed second assistant engineer in the co-ordination section of the Generation Construction Branch, at the headquarters of the British Electricity Authority. For the past four years he has been third assistant engineer in the Generation Design Branch at headquarters. Mr. Appleyard was with the Peterborough and Great Yarmouth Electricity Departments successively before nationalization.

Mr. E. O. Pollak has been appointed home trade sales manager of Smart & Brown (Engineers), Ltd. Mr. Pollak was for eight years sales manager of British Electric Domestic Appliances, Ltd., and in 1938 joined the sales staff of Thorn Electrical Industries, Ltd. In 1946 he took up a position with Drubel Distributors, Ltd., with whom he has remained until recently. His offices are at 8, Rose and Crown Yard, King Street, St. James' Street, London, S.W.1 (telephone: Whitehall 8267/8).

Mr. E. O. Pollak

Mr. W. J. Arscott, who has been appointed chief mechanical and electrical engineer for the construction of the new Roxburgh hydro-electric power station, New Zealand, is a North Shields man and was formerly chief engineer with Tyne Plywood Works, North Shields. He has worked on contracts in Southern Rhodesia and other parts of the world.

Mr. A. R. Sibson, A.M.I.E.E., A.M.I. Mech.E., M.(S.A.)I.E.E., city electrical engineer of Bulawayo, who has been elected

Mrs. A. E. Iliffe opening the annual flower show of Benjamin Electric, Ltd., at Tottenham

president of the Association of Municipal Electricity Undertakings of Southern Africa, was born at Durham, England, and went to South Africa at an early age. Besides his professional work Mr Sibson takes an active part in public affairs, being among other things a member of the Immigration Advisory Council and the Bulawayo Town Planning Committee He is also a member of the S.A. Society of Composers and has written many orchestral compositions.

The Area golf final of the South Wales and Monmouthshire Branch of the **Electrical Industries Benevolent Association** will be held on 11th September at the Southerndown Golf Club, Bridgend, Glam. Particulars can be obtained from Mr. L. N. A. Davies, secretary, c/o the South Wales Electricity Board, St. Mellons, Cardiff.

The Birmingham Branch Area of the Association is holding a carnival dance at the Magnet Club, Witton, Birmingham, on 3rd October. Applications for tickets should be made to Mr. L. Wall, hon. secretary, E.I.B.A. Birmingham Branch, Electrical Components, Ltd., 102, Snow Hill, Birmingham, 4.

The annual dinner and dance of the Worthing and District Branch of the **Electrical Contractors' Association,** on behalf of the Electrical Industries Benevolent Association, will be held on 10th December at the Assembly Hall, Worthing. The hon. secretary of the Branch is Mr. G. H. Ellis, 80, Marlowe Road, Worthing.

Mrs. Iliffe, wife of Mr. A. E. Iliffe, director and general sales manager of the Benjamin Electric, Ltd., opened the fourth annual flower show of the Benjamin Social and Athletic Club at Tottenham on 23rd August. There was a record entry of 224 exhibits and the show was followed by a grand concert, during which Mrs. Iliffe presented the prizes, including a silver challenge cup for the best exhibit, won by Mr. A. W. Croney, who has been with the company thirty-one years and whose " clock number " is 1.

Mr. R. Mellor, district manager for the South Eastern Electricity Board at Ashford, Kent, was presented with a nest of mahogany tables at a dinner held in his honour at Ashford. Mr. Mellor has been appointed manager of the new Medway District of the Board.

Mr. C. W. Coppinger, whose retirement from the position of station superintendent at Poplar was reported in our issue of 15th August, had held that position since 1923, not 1947 as stated in our notice. He went to Poplar in 1913 as charge engineer, and later held the successive appointments of steam economy engineer and acting station superintendent before becoming superintendent. He is a member of the Institute of Marine Engineers and of the Institute of Fuel.

Lord Hurcomb has been reappointed chairman of the British Transport Commission for a further year.

Mr. A. E. L. Jervis was recently appointed technical press officer by the English Electric Co., Ltd. Mr. Jervis is a former apprentice of the company and until his new appointment was on the editorial staff of the *Electrician*.

OBITUARY

Mr. A. Brammer.—We report with regret the death on 30th August, after a long illness, of Mr. Albert Brammer, Companion I.E.E., general secretary of the Association of Supervising Electrical Engineers. Mr. Brammer was born at Burslem, Staffs, in 1891 and was educated at the local technical school. He had been with the A.S.E.E. since 1921.

The late Mr. A. Brammer

Mr. Brammer was a valuable and enthusiastic worker for the Electrical Industries Benevolent Association. He had been a member of the Court and the Relief Committee since 1936 and was chairman of the latter Committee for the past five years. Cremation took place at the Golders Green Crematorium on Wednesday last.

Sir Walrond Sinclair, K.B.E., whose death occurred in London on 30th August, at

the age of seventy-two, was president of the British Tyre & Rubber Co., Ltd., and a director of the India Rubber, Gutta Percha & Telegraph Works Co., Ltd. He was chairman of both companies until June last year. During the war he was Rubber Controller.

Mr. J. F. van der Laan, director of finance of Philips Electrical Industries, was killed in an accident at Wezep, in Holland, on 20th August. Mr. van der Laan was fifty-three. With his death the Philips concern loses one of its ablest administrators and shrewdest financial experts. Only a short time before he had been appointed a member of the newly constituted Finance Council of the international Philips organization. He was chairman of the Executive Committee of Finance and Administration of the Philips group in England, and a member of the Council of the Netherlands Chamber of Commerce. Mr. van der Laan began his career in a Rotterdam Bank. In 1924, after gaining some experience in commerce and in the study of accountancy, he joined the Dutch Philips concern in the audit department. In 1932 he came to England as chief administrator and he was subsequently appointed a director of Philips Lamps (afterwards Philips Electrical, Ltd.). He relinquished this appointment when he became a director of Philips Electrical Industries.

The late Mr. J. F. van der Laan

Mr. F. Fenn.—I.T.D., Limited, in association with Austin Crompton Parkinson Electric Vehicles, Ltd., announce the death on 17th August of Mr. F. Fenn, A.I.Mech.E., who was one of the first executives to join I.T.D., Ltd., and was responsible for producing the first " Stacatruc " fork lift truck in 1946. At the time of his death he was liaison engineer for the company working in close collaboration with the home and overseas sales divisions and the Projects and Planning Branch.

Mr. George Morgan, M.I.E.E., formerly general manager of the Glasgow Corporation Electricity Department, and latterly a part-time member of the South West Scotland Electricity Board, died on 25th August at the age of sixty-nine.

After completing his education and technical training, Mr. Morgan joined the Glasgow Electricity Department in 1905, serving for a period as engineer-in-charge in the various substations and power stations of the Department. He became assistant superintendent of substations in 1914, and three years later was appointed resident engineer at Port Dundas station. In 1919 Mr. Morgan was appointed assistant superintendent of power stations, and in the following year, superintendent. His next appointment was as assistant engineer (1921) and in February, 1940, he became acting manager, later in the same year taking up the position of general manager. On nationalization in 1948 he was appointed a part-time member of the South West Scotland Electricity Board, which position he relinquished at the end of last year. Mr. Morgan was chairman of the Scottish Centre of the Institution of Electrical Engineers for the 1929-30 session.

Mr. H. Bedson.—The death occurred on 22nd August, at his home at Sandon Road, Meir Heath, North Staffs, of Mr. Harry Bedson, B.Sc., A.M.I.E.E. Mr. Bedson, who was sixty-four, was for many years principal of the Burslem, Fenton, Longton and Tunstall Technical Schools. He was also a lecturer at the North Staffordshire Technical College.

WILLS

Mr. K. R. Mackley, manager of the Liverpool branch of Cryselco, Ltd., who died on 9th February last, left £6,263 gross (£5,654 net).

Mr. F. Mew, late sales manager of Desoutter Bros., Ltd., who died on 19th June, left £4,596 gross (£4,031 net).

Mr. H. W. Snowball, late general manager of Sunderland Corporation transport undertaking, who died on 1st January last, left £4,385 gross (£4,263 net).

Mr. T. B. Stanaway, former branch manager at Swansea of British Insulated Callender's Cables, Ltd., who died on 28th March last, left £2,845 gross (£2,073 net).

Mr. W. H. King, proprietor of King & Co., electrical engineers, Bristol, who died on 23rd February last, left £19,694 gross (£13,224 net).

Mr. H. Morehouse, regional manager of Philips Electrical, Ltd., and previously branch manager at Leeds, who died on 2nd April last, left £16,252 gross (£16,176 net).

Mr. F. T. Milne, F.I.E.S., of the General Electric Co., Ltd., who died on 6th June last, intestate, left £2,797 gross (£2,691 net).

Dr. Friedrich Gruenewald, A.M.I.E.E., a circuit breaker specialist with Ferguson, Pailin, Ltd., who died on 14th June last, left £1,508 gross (£1,503 net).

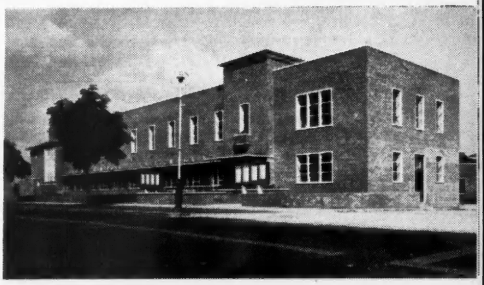
Mr. A. H. M. Jacob, a director of W. T. Henley's Telegraph Works Co., Ltd., and the Henley subsidiary companies, who died on 3rd June last, left £24,792 gross (£22,598 net).

Mr. P. W. V. Fright, late sales manager to the Jackson Electric Stove Co., Ltd., who died on 12th June last, intestate, left £852.

Dr. H. W. Malcolm, M.A., Ph.D., D.Sc., A.M.I.E.E., technical director of R. & J. Connell, Ltd., who died on 25th October last, left £24,679 gross (£24,101 net).

New London Transport Garage

"Prototype" Layout at Watford



AT Garston, Watford, the London Transport Executive has constructed a garage for its "country" service buses and coaches which, although not the first to be completed under the post-war programme, represents the nearest approach yet to the ideal basic design. This has been made possible by the favourable size and shape of the site, which covers an area of some three acres bordering the St. Albans road. Its design may therefore be regarded as the prototype of the series.

There are three main buildings: the operating and welfare block, a covered parking area, and the dock with ten pits for vehicle overhauls. The parking accommodation has an unobstructed floor area of 45,400 sq ft, with a roof span of 170ft. It can house 150 vehicles. At the entrance there are service lines for vacuum cleaning, washing, re-fuelling and oiling, and adjoining buildings house the fuelling and oil pumps, air compressors and high-pressure steam cleaning unit. The vacuum cleaning installation (British Vacuum Cleaner & Engineering Co., Ltd.) comprises an F.A.6 turbine exhauster driven by a 40 b.h.p. motor and an E.8 exhauster with 27 b.h.p. motor. Three Ingersoll Rand 22 cu ft F.A.D. compressors provide the compressed air service, supplying a ring main encircling the garage, with hose points at intervals on the walls and in the repair pits. Ventilation of the main parking area is by vertical shafts with fans discharging to atmosphere.

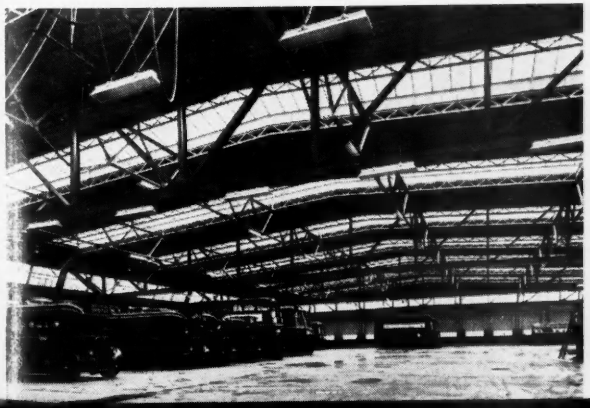
In the dock building there is a special system whereby flexible pipes can be connected to the vehicle exhausts to discharge the fumes via underground pipes into vertical shafts equipped with fans. Mono pumps are installed for water disposal.

Apart from the canteen and the roadways, lighting is generally fluorescent. The lighting equipment includes the following: Strong Electric Corporation "Flarelite" and "Pressura," Troughton & Young "Tubalux," Falk, Stadelmann batten, "Mazdalux" bulkhead, G.E.C. wellglass and "Metrovick" opal glass fittings. In the dock pits there are special G.E.C. vapour-proof 3ft 40 W fluorescent units, L.T.E. pattern. Outside, sodium lamps are installed on L.T.E. standards.

Mr. T. Bilbow, the Executive's architect, was responsible for the design and construction of the garage under the general direction of Mr. P. Croom-Johnson, the chief engineer. In the design of the electric light and power installation he was assisted by Mr. T. C. Ball, plant engineer, in co-operation with J. H. Coombs & Partners. The general layout of plant and equipment was handled by Mr. J. H. Williams, equipment engineer (road services).

The main contractors were Leslie & Co., Ltd., and Barlow & Young, Ltd., were responsible for the electrical installation.

The covered parking area extends to 45,400 sq ft, with a roof span of 170ft



SOUTH AFRICAN NOTES

From Our Cape Town Correspondent

THE Electricity Supply Commissioner's new £3,600,000 Hex River power station at Worcester was recently connected with the Cape Western electricity supply system. This has lessened the need for load shedding in the Cape Peninsula and adjacent country districts. Only one 20,000 kW generator has so far been put into commission, but it is expected that the second unit will be ready by September and the third by the end of the year. The power station will eventually supply most of the power for the Touws River railway electrification scheme.

Infra-red heating equipment of a new form for industrial purposes is now being manufactured by a firm in Johannesburg. The equipment is constructed in individual projector units, which basically comprise tubular metal-sheathed elements mounted in trough reflectors. The length of the units now being made is 36in, and the overall height just over 11½in. The units can be made up into batteries of any size, length or height for specific purposes, and extensions can readily be made to existing plants. The individual units are easily portable. The loading of each projector is 4 kW, operational radiating temperature being attained in two to three minutes. The projectors are designed to operate at a maximum surface temperature of 750 deg C, 5,000 hours being the average life of the element under normal operating conditions.

A considerable amount of equipment has been set up in the high voltage section of the South African Bureau of Standards. At present there are facilities for insulator and cable testing up to 80 kV, but when further equipment has been installed tests up to 200 kV will be possible. The section is now doing such testing as that of the insulation of cables, wet and dry flashover tests on bushings and insulators, and spark tests on small cables. A shearing bridge to measure capacitances and dielectric losses has been installed. Electric cookers are tested in a specially air-conditioned room. The tests are designed to establish the mechanical construction and standards of workmanship, safety and efficiency, as well as accuracy of thermostat calibration.

Atomic Power Economics

A COMPARISON of the probable constructional and operating costs of a nuclear power plant with those of a modern steam plant made by Mr. Walker L. Cisler is reported in the *Electrical World* of 11th August. Mr. Cisler is president of the Detroit Edison Co. which, with the Dow Chemical Co., is studying the industrial use of atomic energy.

He says that as a source of heat energy alone atomic fission is unlikely to be commercially successful in the foreseeable future without assurance of additional revenue from the sale of atomic by-product materials like plutonium.

After showing that a nuclear reactor would replace only the heat-producing elements of a power plant, the electrical generation elements remaining basically unchanged, Mr. Cisler says that estimates based on Detroit Edison's new St. Clair plant put the cost of the steam generation facilities at $77 per kW of capacity and the electric generating plant at $81/kW.

It is calculated that the St. Clair steam-producing plant will deliver heat energy at a cost of 57·7 cents per million B.Th.U. To secure this result with a nuclear reactor, assuming no fuel or other operating expense after the initial investment, the company would be justified in spending $227/kW on the reactor.

As the cost of fuel rose so the justifiable investment would diminish until with uranium at $56/lb justifiable investment would reach the limit of $77/kW, the cost of the normal steam-raising plant. If uranium cost as much as $83/lb no investment would be justified.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Regulation 404J

MAY I reply to your correspondent E. H. Marshall (*Electrical Review*, 22nd August) and state that we manufacture and market a moulded switch mounting block and have designed a base cover which, when used in conjunction with the block, enables circular pattern switches (both standard and miniature) to be fitted and comply with the regulation.

The reason why the complete article is not readily available, is the complete lack of demand on the part of the trade. About twelve months ago I understood that the accessory manufacturers were not a little worried that they might be faced with heavy expenditure in re-designing their switches to bring them into line with one already on sale which does comply with the regulation, but my attempt to interest them before one of their usual meetings began was unsuccessful.

Is any accessory manufacturer interested now?

*Tottenham, N.*17. A. L. HULL
(Radiamp Co., Ltd.).

Street Lighting Improvements

Fluorescent System at Abertillery

RECENT improvements to the amenities of Abertillery have included a new bridge (one of the first prestressed concrete bridges in Great Britain) and the introduction of G.E.C. sodium lighting along nine miles of main road. Fluorescent lanterns also supplied by the General Electric Co., Ltd., have been installed in the main shopping centre and on the bridge, where they are an integral part of the bridge structure. The installation was carried out by the South Wales Electricity Board. The bridge is lit at night by six G.E.C. Z8381 "Three-Eighty" lanterns, each of which houses 5ft 80 W "Osram" fluorescent lamps. Twenty-four lanterns of the same type are installed in the main shopping area. Nine miles of roadway in a continuous line from boundary to boundary of the urban district are now illuminated by 270 "Osram" 140 W sodium lamps in G.E.C. "Perspex" plate refractor lanterns. These are mounted on the existing wood transmission poles and on 25ft concrete columns interposed to provide a staggered formation along the road wherever possible. Special brackets were employed on the transmission poles to avoid the overhead lines, increase the mounting height and facilitate erection without interruption of the power supply. Reversing the brackets gave a further 2ft clearance where it was necessary to avoid projecting transmission brackets. The lanterns used with these brackets were the G.E.C. Z9460 type, in which the gear is enclosed and the usual box dispensed with. The columns throughout this installation were supplied by Stanton Ironworks, Ltd.

UXBRIDGE U.D.C. is to submit to the Ministry of Transport for approval a scheme estimated to cost £4,500 for the improvement of the street lighting of Cowley Road, High Street and High Road, Cowley.

ROWLEY REGIS Corporation is recommended to approve a scheme estimated to cost £4,474 for electric street lighting in Reddal Hill Road, High Street and Forge Lane, Cradley Heath.

DURHAM City Council is to submit to the Ministry of Transport a scheme estimated to cost £2,120 for the provision of street lighting in Sutton Street, Alexandria Crescent and Crossgate Peth.

Foundry Bridge, Abertillery, by day, showing the concrete street lighting columns designed as an integral part of the parapet walls

Douglas (I.O.M.) Report

IN his report for the year ended 31st March last, Mr. C. Anderson, M.I.E.E., M.Inst.F., the borough electrical engineer and manager of Douglas (I.O.M.), shows that the total income was £217,468 and the working expenditure £179,654, leaving a gross profit of £37,814. Capital charges amounted to £56,169, causing a deficit of £18,355, which was met by the transfer of an equal amount from the reserve fund which now stands at £6,711. Capital expenditure in 1951–52 was £279,146, of which about £92,000 was on account of the change-over from d.c. to a.c., which was completed during the year.

The year's output was 20·1 million kWh, a decrease of 3·6 million kWh on 1950–51, said to be due to the entire cessation of the bulk supply to the Isle of Man Electricity Board. The maximum load was 6,250 kW.

It is stated in the report that the extension at the Pulrose power station is nearing completion. The 5,000 kW turbo-generator is ready and one of the h.p. boilers is available for use on oil firing with the auxiliary burners.

E.H.V. TRANSMISSION

Equipment and Operation Described

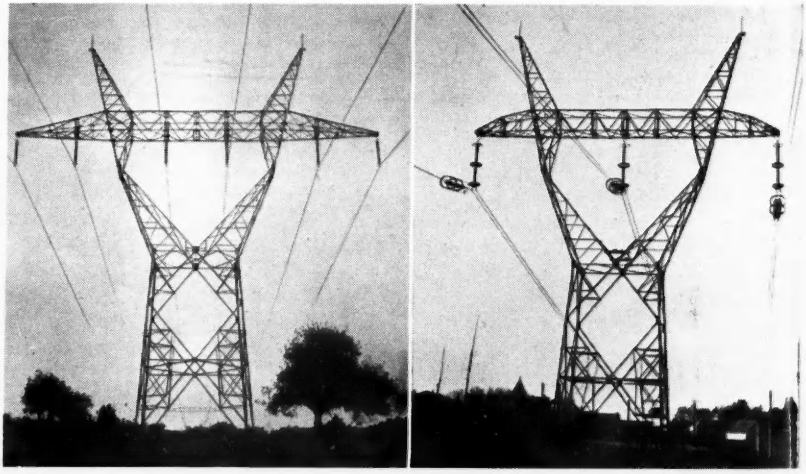
FOUR lectures on power transmission at over 225 kV (at present exceeded only in Sweden and California) which were delivered by Mr. François Cahen at London University last year have now been issued by B.E.A.M.A. in booklet form.* The author first considers the factors governing choice of voltages up to 400 kV and the nature of the technical problems that await economic solutions. He then shows that a new system at a higher voltage should be introduced as soon as an existing system is fully loaded and has enough lines in parallel to achieve security.

France possesses a 225 kV transmission and interconnection system of over 3,400 miles, in which the more important power exchanges take place over an average distance of 300 miles between water power resources towards the south and steam stations near coal fields in the north. Conditions within the next few years may call for 380 kV; a 225 kV two-circuit line of 250 miles which is convertible to a 380 kV single-circuit line has been erected. Similar lines are under construction in Western Germany.

Corona problems form the subject of two of the lectures which include particulars of tests carried out in France and elsewhere. Corona, due to discharges from a conductor periphery when the surface electric field exceeds the disruptive field of the surrounding air, becomes of importance only at voltages above 100 kV. As the voltage is raised, conductor diameter has to be increased more rapidly than the economic cross-section would necessitate. For that reason steel-cored aluminium conductors are often used, the steel having low conductivity and the aluminium a resistivity 60 per cent higher than that of copper.

* " Problems of Power Transmission at Voltages above 225 kV." By François Cahen, Joint Director of Research, Electricité de France. (Pp. 64; figs. 75.) Published by the British Electrical and Allied Manufacturers' Association, 36, Kingsway, London, W.C.2. Price 5s.

Left: **Tower of the Breuil-Chevilly 225 kV double-circuit line, convertible to 380 kV single-circuit line.** *Right:* **French 380 kV tower with bundle conductors (two per phase)**



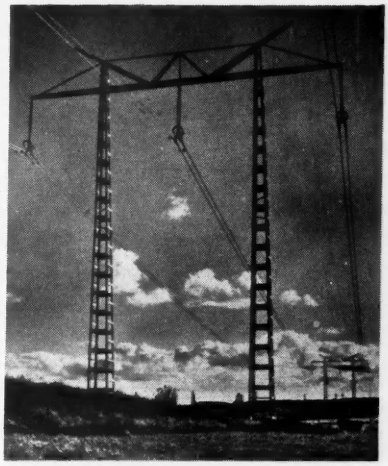
The 225 kV lines in France are of 0·64 sq in section (aluminium 0·51 sq in and steel 0·13 sq in); their diameter is 1·04in. The equivalent copper conductor possessing the same resistance, 0·143 ohm/mile at 68 deg F, would be 0·31 sq in and have the insufficient diameter of 0·73in. The economical limit of this type of conductor is probably about 1·6in (1·5 sq in).

An alternative construction, as adopted for the 287 kV Californian system, is a hollow copper conductor composed of flat interlocked wires stranded in spiral; these conductors are 0·4 sq in and 1·4in. A third type, employing aluminium and steel with a filler between, enables any external diameter, e.g., 2in, for a given metal section to be employed. For the highest voltages "bundle" conductors can be used, with two or more conductors spaced apart per phase to reduce the surface electrostatic field of each.

From experimental research in different countries it appears that the technical problems of corona effect in relation to losses and radio interference have been solved up to 400 kV and possibly for 600 to 800 kV through an increase in the number of conductors per bundle. The influence of the weather and the surface condition of conductors in relation to disruptive discharges is great. Corona losses occur along the whole length of a line, those due to insulator strings or at conductor fixing points being comparatively slight.

Radio interference, however, seems to be localized and the effect of brush discharges at insulator strings and fixing points are likely to be as serious as those from the conductor itself. Since the problem may also arise at moderate voltages (the more so as spans are shorter and towers more frequent), the best guide in the present state of knowledge is to use existing systems as a basis of comparison. Possibly at very high voltages radio interference rather than losses will set a limit to the operating voltage of a line with a given equipment.

Theory and practice relating to over-voltages and surges were dealt with in the final lecture. Insulation of lines and station equipment above 225 kV seems unlikely to cause serious difficulties. It must withstand internal over-voltages and surges—the first due to sudden variations in system characteristics arising out of, for instance, unsymmetrical phase-to-earth faults and tripping of long lines under load. Internal



Swedish 380 kV tower with bundle conductors (two per phase)

surges are produced in switching, including clearance of short circuits, energizing or de-energizing long lines on no load and interruption of transformer magnetizing currents. Regarding external surges, since the crest values of lighting surges are practically independent of the line operating voltage, the higher the voltage employed the less the need becomes to consider atmospheric disturbances and the greater becomes the tendency for the ratio between the insulation level of the installations and operating voltage to decrease.

Solid earthing of the neutral is becoming universal at very high voltages; arc-extinguishing coils are being abandoned even at lower voltages. Solid earthing of all neutral points, however, increases the earth-fault currents to be cleared which, in association with higher voltages, entails very much greater switchgear dimensions. In France short circuit power in parts of the existing 225 kV system is already nearly 4,000 MVA and is expected to reach 8,000 MVA or above at 380 kV, as in Sweden.

When distances exceed 500 to 600 miles the transmitting capacity is directly conditioned by dynamic stability. The critical distance of long lines can be increased, however, by such means as automatic single-phase or three-phase reclosure, high-speed fault clearance, shunt compensation or series capacitor compensation. The choice

between different methods and their use in combination is generally made possible only through scale models of the systems. A.c. network analysers are now widely used for carrying out all studies of network structure and operation, including stability problems. A micro-network developed in France incorporates rotating machines possessing the same electrical and mechanical characteristics as the actual machines.

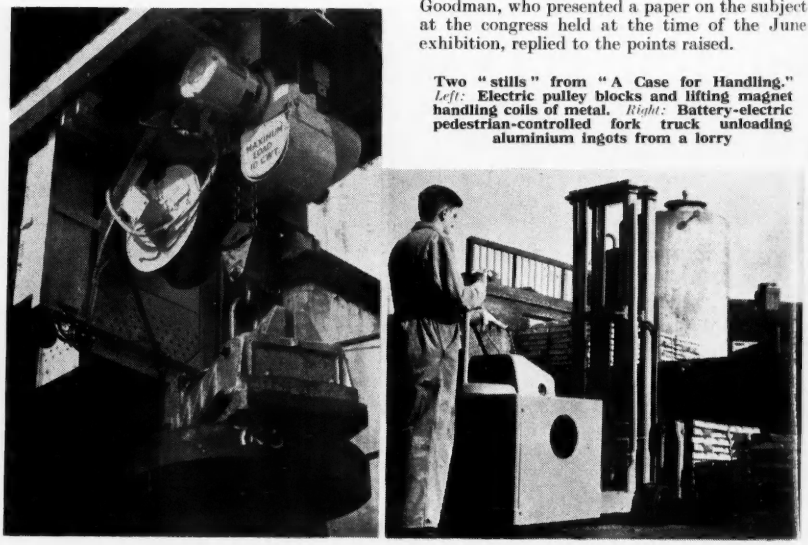
NEW E.D.A. FILMS

AT the Mechanical Handling Exhibition in June the British Electrical Development Association arranged a "pre-view" of its film "A Lease for Handling." The film has now been "generally released" and was shown to Press representatives last week. Although severely practical in character this film has been produced in an entertaining way with the co-operation of a number of industrial concerns, including some in the electrical industry. It comprises a series of well-linked "shots" made in factories turning out a variety of products and shows very vividly examples of the plant and methods now available to eliminate manual handling of goods and speed up production.

The factory scenes are superimposed upon a conversation between a works manager, a materials handling engineer and an industrialist whom the first two are endeavouring to convert to the mechanical handling idea. The film should certainly instruct and interest those to whom it is directed—workers, foremen and staff up to the level of works managers. It was produced by Mr. Humphrey Swingler and directed by Mr. Peter Plaskett (Greenpark Productions, Ltd.) assisted by members of the E.D.A. staff.

A second film exhibited on the same occasion is "Distribution of Electricity" which graphically illustrates the layout of the distribution network in a typical small town. After a step-by-step explanation of the structure of the system it concludes with what might be called an "effective anti-climax." It is designed in the first place for young electricity supply technicians and technical college students, but it has sufficient interest for more general audiences. The film was made by Merton Park Studios, the producer being Mr. F. A. Hoare and the director Mr. John Durst.

At the meeting Mr. V. W. Dale, general manager of E.D.A., introduced the films and mentioned that about 1,000 prints a month of the Association's educational films were going out for exhibition to many kinds of audience and that about 1,900 copies had been sold. After the screening of the films Mr. J. I. Bernard (E.D.A.) invited questions and he and Mr. L. L. Goodman, who presented a paper on the subject at the congress held at the time of the June exhibition, replied to the points raised.



Two "stills" from "A Case for Handling." *Left:* **Electric pulley blocks and lifting magnet handling coils of metal.** *Right:* **Battery-electric pedestrian-controlled fork truck unloading aluminium ingots from a lorry**

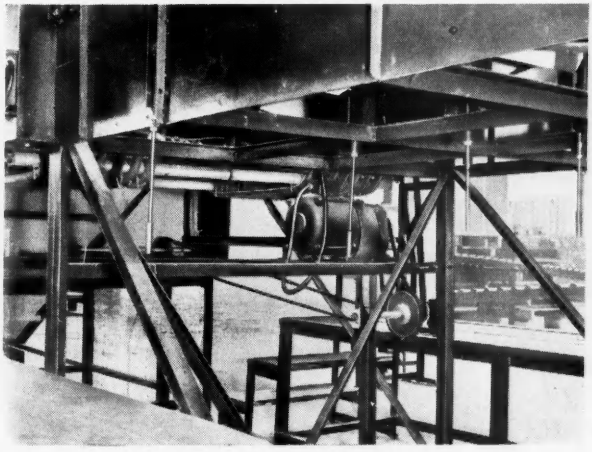
Tomato Packing

Use of Electricity for Grading and Storing

ELECTRICAL methods are employed extensively for the mechanical handling, grading and cold storage of tomatoes at a new packing station, believed to be the largest in Europe, which Nursery Trades (Lea Valley), Ltd., have recently opened in Crossbrook Street, Waltham Cross, Essex. Designed to deal with the produce of four hundred or so tomato growers in the Lea Valley area (which produces about one-quarter of the country's tomato crop), the new building has at present the capacity to handle about one-fifth of the total output of the district. By its use it is the aim to improve marketing facilities against foreign competition and to narrow the price gap between what the producer receives and what the consumer pays. The building is also to be used for the collection, grading, storage, packing and marketing of cucumbers and other nursery farm produce.

The grading hall, which measures 160ft by 85ft, is at present only a quarter of its eventual size; plans provide for additions in three stages. Its present floor area is large enough to accommodate four 3½ tons/hour grading machines and three units made by Grading Machinery, Ltd., have already been installed. Owing to the practice of keeping the produce from each grower completely separate it is not, however, possible to attain maximum output from the machines, normal operation being between 2 and 3 tons an hour each.

Above: **One of the tomato grading units.** *Below:* **Geared motor driving portion of the conveyor system on a grading machine**



The fruit arrives at the packing station by lorry in quarter-bushel wooden boxes, unweighed and ungraded. After booking and marking, these boxes are taken by stillage trucks to the graders where the fruit is tipped out on

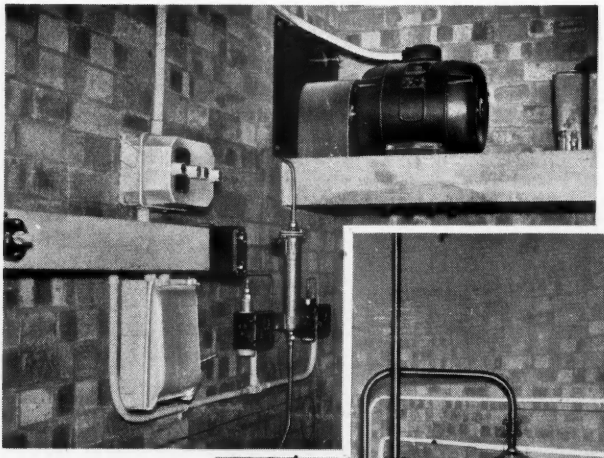
to an inclined slat type elevator. At the top of this elevator spaced rubber bands allow the "chats" or undersized fruit to drop through, the remainder passing on to the sorting conveyors on each side of the machine. Here girls remove the "roughs" (poor quality) and "blues" (badly shaped) and place them on two conveyors running one above another along the centre of the machine and discharging on to short cross conveyors.

The high-quality fruit continues along the main conveyors to the grading conveyor which consists of rubber bands close together at one end and gradually getting farther apart at the other. Only two motors are required to drive the grader, one for the elevator and the other for the remainder of the machine. These motors are of the Neco ¾ h.p. 52 r.p.m. geared type with chain drives. They are equipped with "Auto Memota" starters and Simplex switch fuses.

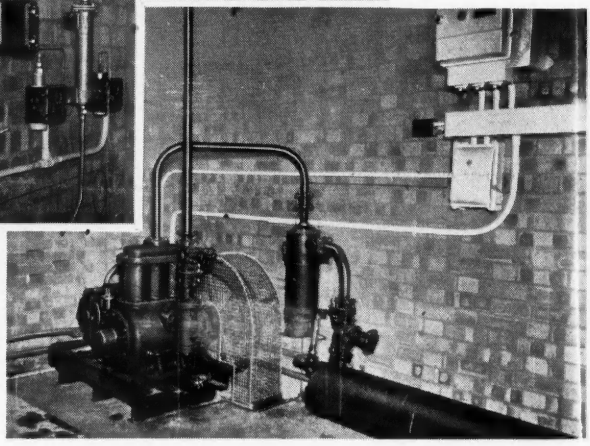
From the grading conveyor the fruit is discharged on to three conveyors running at right-angles. On these cross conveyors, which are each driven through Oppermann gears by means of a ¼ h.p. 1,425 r.p.m. B.T.H. motor, the fruit is hand separated for ripeness and then passed down a chute, fitted with an automatic rough weighing device, and packed in 12 lb cardboard boxes. Travelling down roller conveyors the boxes are weighed accurately, stamped and labelled.

In times of glut, use may be made of a cold store constructed by Moss Storage (Gt. Britain), Ltd., to hold 80 tons of fruit. Tomatoes are, however, a somewhat difficult fruit to store and quickly deteriorate if strict attention is not paid to optimum temperatures. For only one day's storage the temperature is not taken below 55 deg F. Ten days is found to be the maximum storage period and for this time the best temperature is between 47 and 48 deg F, particular care having to be taken when removing the fruit from store to raise the temperature gradually.

The refrigeration plant comprises an



Left: **Motor driving the circulation fan in the cold storage room**



Right: **Refrigeration plant used for the cold storage chamber**

Ernest West and Beynon " Verikold " unit employing " Arcton 6 " refrigerant and driven by a 7½ h.p. 1,400 r.p.m. Crompton Parkinson slip ring motor with Allen West starter and Bill switchgear. Air in the cold store is circulated by means of a Keith Blackman fan, which is arranged for two-speed operation by a Crompton Parkinson 4½ h.p. 720/440 r.p.m. motor (Allen West starter). Provision is made by Bill rotary switches for both manual and automatic control by Teddington pressurestats.

Most of the artificial lighting of the grading hall is indirect, coming from parabolic reflectors directing the light upwards on to the curved white ceiling. Downward lighting from reflectors is used in the low ceiling areas of the receiving and despatch bays. Heating of the building is by unit heaters installed by Smeaton & Son, Ltd. An A.T.M. public address system has been provided. The electrical installation was carried out by J. Arthur Moss, Ltd.

BRAZIL ELECTRIFICATION PLAN

From Our Rio Correspondent

THE Export-Import Bank has authorized a loan of U.S. $41,140,000 to Empresas Electricas Brasileiras, a subsidiary of the American & Foreign Power Co., to finance imports of equipment for the company's expansion programme, which will involve an expenditure of £40,000,000, spread over four years. The work planned will raise installed potential by 175,000 kW in zones served by Empresa Electrica's associates in S. Paulo, Parana, Minas Geraes and the State of Rio, and improve distribution systems in Bahia, Espirito Santo, Maceio and Natal.

Three other projects, forming part of the national electrification plan, have been approved by the Brazil-United States Commission for Economic Development. All call for loans from the Export-Import Bank or from the International Bank for Reconstruction and Development. Those authorized by the former will finance imports from the United States, but International Bank loans will be used to purchase foreign exchange and pay for imports from other countries.

Project No. 5 aims at raising installed potential in Rio Grande do Sul from 96,000 to 300,000 kW within seven years. It is to be carried out in three stages. The first, now nearing completion, provides for one thermal and three hydro-electric stations, with a total potential of 24,000 kW. The second, for which the International Bank has approved a loan of U.S. $25,000,000, includes four thermal and four hydro-electric stations, to raise potential by a further 137,200 kW. The final stage will provide two additional stations, with a total capacity of 46,000 kW, at Jacui.

Project No. 6 refers to a central hydro-electric station at Salto Grande, the centre of an important coffee and cotton zone in S. Paulo. The equipment, for which a loan of £3,000,000 is required, includes four generators of 15,300 kW each. The station will supply additional power to five public service companies and enable the Sorocabana Railway to electrify its system.

Project No. 9 forms part of the scheme to build five central hydro-electric stations in Minas Geraes, referred to in the *Electrical Review* of 14th September, 1951. It relates to the 36,200 kW hydro-electric plant at Ututinga, centre of a rich mineral zone, for which the Mixed Commission recommends a loan of U.S. $5 million to import equipment. Part of the power supply will be used to electrify the local State railway. The Santo Antonio station, now nearing completion, will contribute 100,000 kW, of which about one-third will be taken by the Mannesmann Steelworks, being built near Belo Horizonte. Work on the Piau and Tronqueiras stations is advancing rapidly. The former will serve an important industrial zone and permit electrification of a section of the Central Brazil Railway.

These stations, and that at Fecho do Funil, will be inter-connected, so that a deficiency in one may be promptly compensated.

The Commission for Economic Development of the San Francisco region has been authorized to promote the utilization of the hydraulic power of the falls on the Rio Corrente and its affluents in Bahia. In July the Brazil-United States Commission recommended a loan of U.S. $8,500,000 to import equipment and complete the first stage of the work at the Paulo Afonso station. The next stage, to be concluded in 1955, will raise the capacity from 120,000 to 180,000 kW. By December last the company had imported equipment valued at £5,360,000.

The Commission is now considering an application for a loan to equip the 10,000 kW station at the Funil Cataract, Rio de Contas, Bahia. The local government plans to build and exploit, with mixed State and private capital, two other stations, Pedra and Pancada, in the same zone, increasing installed capacity by 81,000 kW.

Several industrial enterprises have been authorized during the past three months to utilize the hydraulic power of inland rivers for their own services. Such concessions usually carry the obligation to provide current for public consumption where no other adequate supply is available.

The renewal of the German-Brazilian trade agreement, ratified in June for one year, schedules exports to Brazil of the following electrical materials, the values being quoted in millions of U.S. dollars: motors, generators and accessories, 2·3; telephone, telegraph and wireless apparatus and accessories, 1·4; medical apparatus, 1·1; cables and accessories for installations, 1·0. Between 1950 and 1951 the value of Brazil's imports from Germany rose from £7 million to £41·5 million, while exports to Germany increased from £6·7 million to £31·1 million. The balance against Brazil has increased this year and licences to import German goods are being granted with more restraint.

The director of the Central Brazil Railway announced in July that the firms which tendered for 200 electric train units have been classified in the following order: (1) Metropolitan-Vickers Electrical Export Company; (2) S.I.G., of Switzerland; and (3) The Budd Company, Philadelphia. The following prices were quoted for 95 units to be supplied immediately: Metropolitan-Vickers, 403 million crs. (£8,060,000); S.I.G., 433 mln. crs. (£8,700,000); Budd, 504 mln. (£10,080,000).

Trades Union Congress

IN his presidential address at the opening of the Trades Union Congress meeting at Margate on Monday last, Mr. Arthur Deakin (general secretary, Transport and General Workers' Union) said that the T.U.C. General Council had warned the unions of the dangers which beset the national economy. It had pointed out that the adverse balance of trade could not be restored without a strong and sustained effort to increase production to meet domestic needs and sell our products in the markets of the world.

The formulation of wages policy was not something which could be used as a mere form of propaganda. Demands designed merely to cause unrest could be regarded only as a betrayal of the real interest of the people they represented. The Council was not opposed to wage increases, but it urged the observance of reasonableness and the exercise of good sense in the formulation of wage claims.

Trade union responsibility was no less onerous and inescapable than was that of the Government and the employers. In trade union philosophy there was such a thing as ethical economics. It demanded of each of them a return for what he took out of the community in goods and services.

Midlands Home Life Exhibition

THE 21st Leicester and East Midlands Home Life Exhibition will be held at the Granby Halls, Leicester, from 10th to 20th September. The subject of the exhibition is home management, and the electrical exhibitors will include the Electrical Equipment Co., Ltd.; Kenwood Electrics, Ltd.; Midland Electric Co., Ltd.; Midland Dynamo Co., Ltd.; Geo. Green (Leicester), Ltd.; Hoover, Ltd.; J. Orton (Electricians), Ltd.; the British Vacuum Cleaner & Engineering Co., Ltd.; and Chance Bros., Ltd.

Engineering in Europe

Survey of Current Literature

THE great majority of papers on surge phenomena in transformers deal with atmospheric surges propagated by travelling waves, as these are rightly regarded as the most dangerous of their kind. This is due less to the absolute values of the potential of the incident travelling wave than to the high potential gradients between adjacent turns and coils owing to the capacitive potential distribution set up along the winding, and to the quasi-steady equalizing processes consequent upon it. However, where auto-transformers are used as regulating transformers, short-circuits may produce, under unfavourable conditions, over-voltages far in excess of atmospheric surges. These short-circuits are not of the usual kind due to metal contact between different phases at either the generator or the consumer's side, but are of the type known as asymmetrical two-phase faults and are due to contact between one phase at the consumer's side with another on the generator side.

A thorough qualitative and quantitative analysis shows that, on whichever side the transformer is energized, the yoke-fields set up will produce an unbalance voltage at the star-point which, particularly for transformers with special return paths for the magnetic flux, and for low values of the ratio of regulating voltage to exciting voltage, may reach excessively high voltages. The currents set up in the windings and in the system will be correspondingly great and exceed those set up by a three-phase short-circuit. A partial, though not perfect, remedy is a delta-connected compensating winding, the effect of which will be investigated in a subsequent communication.—" The Danger of Very High Surge Voltages Occurring at the Star-Point of Regulating Auto-Transformers," H. Rösch, *E. und M.*, Vol. 69, No. 7, pp. 161–171, 1st April, 1952, in German.

Mapping Potential Fields

The electrolytic tank is a convenient apparatus for investigating field distributions in electrostatic and magnetic fields in cases in which the solution of the corresponding boundary problems of Laplace's differential equation would be either too laborious or impossible. The possibility of representing electrostatic and magnetic fields by the current fields in an electrolyte arises from the formally complete analogy between these fields, provided polarization phenomena are not permitted to occur in the electrolyte. These are safely excluded by using a.c. for energizing the tank.

Usually the equipotential lines of the field are explored with a sonde connected in a measuring circuit which is adjusted successively to certain potential values, the whole course of the line being found pointwise. The mapping process is thus fairly tedious, if a high accuracy is postulated, which requires narrow spacing of the points on every line. In the tank described, which is only one among a number of similar ones recently built, the sonde is carried on a double carriage, comparable to a lathe carriage, running on a pair of rails normal to, and travelling along, the longer axis of the rectangular tank. The finely adjustable movement of the carriage is continuously and automatically traced out on a sheet of squared paper which eventually becomes the map of the field. The tank and its auxiliaries are described in full detail and examples of fields mapped out by it are shown.—" Electrolytic Tank with Automatic Mapping of Potential Fields," H. Schmidl, *E. und M.*, Vol. 69, No. 7, pp. 155–161, 1st April, 1952, in German.

Transformer Impulse Tests

Essentially, impulse tests are the only valid proof that a transformer is not only well designed, but also well manufactured, and particularly that its insulation will be equal to all stresses which may reasonably be expected to occur during its service life. For instance, dangerous stresses in the interturn and inter-coil insulation cannot possibly be set up in normal operation at 50 c/s, whereas they will certainly occur under the impact of an atmospheric surge,

which is a phenomenon that can be simulated only by impulse tests. There are, furthermore, the questions of the voltage distribution along the winding under a surge wave, the transmission of the stresses from a directly affected winding to a non-affected one, the voltage distribution in the regulating windings or independent regulators, the behaviour of the insulation under a given surge wave, etc.

It is certainly necessary to be very careful in the choice of the waveforms used in the tests and make them correspond in peak value, frontal steepness and duration as closely as possible to the known dangerous types of atmospheric surges. Also, the wave type, full or chopped, is of great importance, particularly considering the possible consequences of damage caused within the insulation by the tests themselves, and thus also the allied problem of detecting and locating such damage before serious harm is done.

There is a further complex of questions relating to the neutral point (directly earthed, earthed through quenching coils, or isolated) and its reaction to surge waves impinging on the line-side transformer terminals, to the co-ordination of insulation, reduced insulation, etc., and to the evaluation of the results of impulse tests.—" Problems of the Impulse Characteristics of Transformers (General Features of the Problem)," R. Langlois-Berthelot, *Revue Générale de l'Electricité*, Vol. 61, No. 4, pp. 175–184, April, 1952, in French.

Supply Reliability

The question of the reliability of the supply in any power system is of the greatest economic importance, as the recent experience of power cuts has brought home to nearly everybody. Yet fuel scarcity and sudden stoppages of the fuel supply are not really the problems the power engineer on the planning and production side is, or should be, principally concerned with. His main problem is, and will remain, how to cope with existing and future demands on power supply systems in terms of equipment installed, transmitting capacity of his lines and networks, despite an unavoidable proportion of breakdowns over a long service period (and on the basis of assured fuel supply). This involves the question of the necessary power reserve, which, again, is mainly an economic problem.

Considering the order of magnitude of the investment required for erecting a sufficient number of power stations to ensure the necessary continuity and reliability of the supply, it is necessary to evaluate the available statistics of existing systems to determine the incidence of outages, the kWh, or MWh lost annually as a consequence and to use probability methods to establish the economically bearable magnitude of the power reserve required to obtain the desired reliability of the supply.

The problem is more complex than this, because it is mostly a question affecting more than a single power system, since interconnected and mutually supporting systems have become the rule rather than exceptions. Accordingly, there will be a number of solutions available for any one problem, of which again probability calculus, among other methods, may help to select the most favourable one under any aspect. — " Probability Laws and Reliability of Power Supply," S. Pacak, *Elektrotechnicky Obzor*, Vol. 41, No. 2, pp. 70–81, February, 1952, in Czech.

[Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.]

Problems of Public Boards

ONE of a series of " Policy Discussion Pamphlets " issued by the Labour Party is " Problems of Public Ownership," by Ernest Davies, M.P. (Transport House, Smith Square, London, S.W.1, price 4d). The purpose of this, as of the others in the series, is to inform and guide members of the party in the evolution of policy. The present booklet contains little that is new but it is presented from the particular angle of the party responsible for nationalization. Although Mr. Davies justifies public ownership he admits that there are deficiencies in the system when put into actual effect.

Remedies for the weaknesses in national board operation are tentatively suggested, although in one major instance, excessive centralization, the author, like most of his predecessors, has found it difficult to set bounds to the extent of the central bodies' authority.

Efficiency is another quality which is hard to define in the absence of competition within the nationalized industries. Mr. Davies thinks that the shortage of coal has prevented real competition between the electricity and gas industries but at the same time he doubts whether such competition would be in the national interest. He maintains that what is required is more co-ordination of the fuel and power industries rather than more competition.

Electricity and Productivity

American and British Practice

TOWARDS the end of 1949 two electricity supply productivity teams (generation and distribution) visited the United States. A statement on the action taken on their report, which was published in October, 1950, was issued this week by the Anglo-American Council on Productivity. In the intervening time this report has been examined by the B.E.A., Area Boards and Joint Advisory Councils. A selection from their comments follows.

Features of power station design in the U.S.A. include combined boiler-turbine units without interconnections, reheat units and semi-outdoor stations. In Great Britain 97 unit plants aggregating 4,727 MW are planned up to 1956 and one semi-outdoor station is being built; the reheat cycle is being considered for three stations and its use is likely to increase.

Boiler availability is regarded as comparable with turbine availability despite differences in quality of fuels used in the two countries. Great improvement has been achieved in the speed of return of generating plant to service after repair, by careful planning and through a scheme of priorities for replacement parts. Power tools and mechanical handling are more widely developed in the United States. The reference in the original report to pneumatic impact nut wrenches has led to greatly increased use of them in Britain.

Switchgear Costs

In main transmission, differences in price levels are noted. For example, an American 1,500 MVA oil circuit breaker costs only 27 per cent more than a 500 MVA unit at the same voltage, compared with nearly 100 per cent in this country. It is recommended that a.c. network analysers (as used by the Merseyside and North Wales Board) should be regarded as essential tools.

Preformed armour rods (as alternatives to arcing horns) for overhead lines are being obtained from Canada for testing. The manufacture of circuit breakers of low rupturing capacity at 132 and 275 kV is under consideration. Owing to the much bigger right of way problem in Britain double circuit construction is used almost exclusively, so H type wood pole construction for single circuit feeders would have little scope. A conductor of heavier section for the grid is not considered desirable; 0·4 sq in is already the second standard for both 132 and 275 kV.

Transformer Design

The British Standards Institution is to revise the transformer specification to associate temperatures with typical British load curves as is now done by the North Eastern Board. Investigations by the B.E.A. while the teams were abroad showed that in emergency transformers could safely be operated at 30 per cent above their firm rating. In the United States modern transformers of over 10 MVA are of the nitrogen gas-covered type, which allows higher operating temperatures and reduces fire risk. At future higher operating temperatures, nitrogen may be required to obviate oil deterioration.

The Midlands Board will shortly install a large transformer operating with nitrogen atmosphere—the first in Britain. The South Eastern and Eastern Boards are considering the use of completely self-protected, pole-mounted, low-iron-loss transformers, as now generally installed in America; one tank contains the transformer, l.v. circuit breaker and protection and control devices, but this type is not yet available in this country.

Maintenance of h.v. overhead lines while alive is not thought to be worth while. The work can be carried out only during the limited time when humidity is under 70 per cent. Moreover, in the United States single circuits are far commoner than they are here. The covering of towers with only one coat of special paint instead of two or three of normal quality is likely to be adopted here. Line patrol by helicopter would not be economic under British conditions, but the Midlands Board has used a

helicopter in connection with the laying of a 1,280ft span of 66 kV line across a densely wooded valley.

Effects of atmospheric disturbance are being investigated by the B.E.A. in collaboration with the Electrical Research Association and results are expected within the next two years. In the Eastern Board's area many surge divertors are used on transformers connected to overhead systems in districts where lightning trouble is prevalent. The South West Scotland Board has them on some 33 kV but not on 11 kV lines.

Substation Practice

Several Boards are developing more elaborate statistical records by special sections to allow closer control of their activities. A recent tendency has been towards the American practice of having a large number of small urban substations, but the South Wales and other Boards hold that conditions in this country do not always justify their adoption. The South Eastern Board uses outdoor substations wherever applicable. The South West Scotland Board considers that this type, comprising 11 kV switchgear and 11 kV/415 V transformers, should be completely metal-clad units, the only objection likely being from Town and Country Planning authorities.

The team suggested that automatic high-speed reclosure of switchgear in conjunction with time-delay fuses on 11 kV and 6·6 kV rural lines would, as well as improving continuity of supply, save operation costs and would thus probably offset the initial cost. The Midlands Board has imported 50 equipments from the U.S.A. for testing, the results of which will determine the action of several other Boards. The Eastern Board has already had satisfactory results with reclosure on rural overhead lines. The South West Scotland Board makes wide use of arc-suppression coils instead.

Preventive maintenance, usually by a separate department as a routine, is the keynote of American practice. The Eastern Board is instituting uniform maintenance for the more usual items and is considering the economics of setting up centralized Sub-Area maintenance gangs for particular equipment such as transformers. Mechanical digging machines with lifting jibs enable poles to be rapidly replaced in the United States. The North Eastern Board is testing a pole hole boring machine.

Cold compression jointing, in which the copper sleeves on the conductor cores are pressed into an apparently solid section by a hydraulically operated tool, saving much time and labour whether with cables or overhead lines, is being examined by a number of Boards. The Midlands Board is developing light-weight compression tools. The more ready use of aluminium (as in the United States) for l.v. overhead conductors depends on this method of jointing.

The American practice of solidly connecting l.v. networks makes for continuity of supply, but a shut-down covers an extensive area for a long time. The South West Scotland Board believes that it would not be advantageous in Great Britain. In American rural areas single-phase supply is general and it is being extended in Great Britain. Joint use and ownership of poles for both power and communication circuits is common in the States. Although agreement has been reached with the Post Office authorities to this practice it is unlikely to be on the same scale here.

The Merseyside and North Wales Board is expanding its existing practice of multiple earthing of rural networks and, like the North Eastern Board, is considering the adoption of expanding anchors and mechanical clamp stay-wire make-offs. Radio communication for maintenance, which has been introduced in many areas since nationalization, will be extended when more v.h.f. equipment becomes available.

Metering Methods

Small meters are frequently installed outside American buildings and prepayment meters are nowhere employed. The Eastern Board is replacing the latter wherever possible by credit meters; increased costs of accounting will be partly offset by outdoor metering for new buildings. The North Eastern Board is installing experimentally m.d. meters which retain a record of the highest reading over 30 minute periods.

No organization yet exists here corresponding to the Underwriters' Laboratory for checking the quality of appliances. A central body for Great Britain is under consideration. The British Standards Institution has a certification mark denoting conformity to defined B.S. and the scheme is being extended to consumer goods. Most Area Boards test specimens of appliances before offering them for sale. The E.D.A. also has a testing house to which manufacturers or retailers can send apparatus.

Commerce and Industry

Engineering Wages Claim

New Electric Iron Factory

LAST week the Engineering and Allied Employers' National Federation replied to the further representations made by the engineering trade unions regarding their claim for a wage increase of £2 a week. The reply was submitted at a meeting of the leaders of the Confederation of Shipbuilding and Engineering Unions at Margate on Sunday last. It was a reaffirmation of the employers' decision that no increase was justified. Higher wages would prejudice the engineering industry's sales at home and abroad with adverse effects upon employment and supplies of food and raw materials from overseas. For these reasons it was not possible to offer an alternative to the proposed £2 a week.

Mr. H. G. Brotherton, chairman of the Confederation, said that the unions regarded this reply as a challenge and would not accept it without resistance. The affiliated unions would be recommended at their meeting at York on 10th September to instruct their members to refuse to work overtime from a specified date and to confine piece-work earnings to the equivalent of time rates for a 44-hour week.

Refinery Electricians' Strike Ended

One hundred and eighty electrical workers who have been on strike at the new oil refinery at Coryton, Essex, since 18th August, decided to return to work on Monday last and allow the negotiating machinery of the industry to operate.

The strike was in support of a claim for a wage increase of 3d an hour, which the men said was in accordance with a national agreement.

Lighting Fittings Makers Merge

The amalgamation is announced of John Bowen Fittings, Ltd., with Payne & Penny, Ltd. The two companies have been indirectly associated for a long time. All production-turning, carving, and finishing will be embodied in one factory at Chelsea and Mr. E. C. Harvey will control the administration of both companies at the offices, 556, Kings Road, Chelsea, London, S.W.6. Mr. J. H. Bowen will continue to direct sales—both home and export—and Government contracts. The showrooms and offices of John Bowen Fittings, Ltd., at 32/36, Caledonian Road, N.1, have been closed and all correspondence should now be addressed to Kings Road, Chelsea.

Electrical Accidents

The report compiled annually by the Ministry of Labour and National Service entitled "Electrical Accidents and Their Causes" is now available for 1950. It is published at 5s by H.M. Stationery Office. A summary of the report will appear in next week's issue.

New Morphy-Richards Factory

A new factory build for Morphy-Richards, Ltd., near their existing works at St. Mary Cray, Kent, will add about 60,000 sq ft to the company's production area. In the new works it is proposed to concentrate on the manufacture of heat-controlled irons and it is hoped that by the end of the year there will be a weekly output of 40,000. Productivity will be improved by the introduction of mechanization of certain processes which are believed to be unique.

The production plant has not yet been installed but it is said that the new factory will be in operation before the end of this month.

Miss P. Hornsby-Smith, M.P., Parliamentary Secretary to the Ministry of Health, performed the opening ceremony on 27th August, when she spoke of the rapid progress

Mr. C. F. Richards (*left*) **with Sir Waldron Smithers and Miss P. Hornsby-Smith at the opening of the new factory**

and achievements of the company since its very small beginnings in 1936. Mr. G. Wansbrough, chairman of the company, presided, and the other speakers were Sir Waldron Smithers, M.P., and the founders of the company, Messrs. D. W. Morphy and C. F. Richards.

Fan Engineering

Most fans are used for air conditioning and it is regrettable that in books on this subject they are all too frequently dismissed in a brief chapter. There are, however, a few books dealing specifically with fan engineering but they require a high standard of knowledge for quick assimilation of the facts presented.

Because of this state of affairs Woods of Colchester, Ltd., an associate company of the General Electric Co., Ltd., has just published a practical guide to fan engineering edited jointly by W. C. Osborne and C. G. Turner. This excellently produced 227-page book, which is available from the company at 10s 6d, presents much information and data on the subject in an easily understandable manner. It contains very little mathematics: the emphasis is on practice.

Electrical Commercial Travellers

A general meeting of the Electrical Trades' Commercial Travellers' Association will be held on 12th September at the Feathers Hotel, Broadway, Westminster, S.W.1, at 5.45 p.m. and will be followed, at 6.45 p.m., by a question forum, at which the question master will be Mr. W. H. Williams, president of the Association. The team answering questions will be Sir Herbert Williams, Mr. G. Schwartz, Mr. C. Brooks, and Prof. A. M. Low. Members are asked to submit questions by 9th September to the social secretary, Mr. H. Bowen, 5, Rowan Road, London, W.6.

Other arrangements of the Association are the ladies' night, which will be held at the Café Royal, Regent Street, London, W.1, on 3rd October, and the annual dinner-smoker, to be held at the Windsor Castle Hotel, Victoria, S.W.1, on 12th December.

Iron and Steel Prices

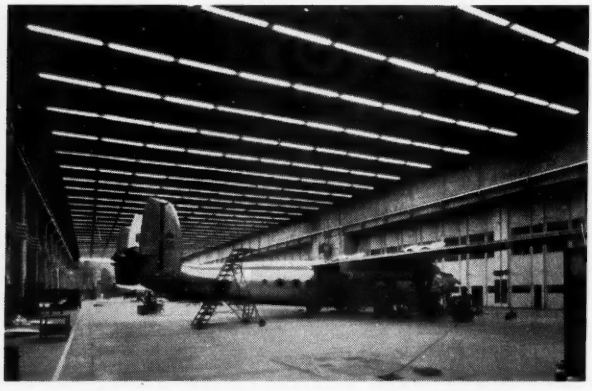
The Iron and Steel Prices (No. 2) Order, 1952 (S.I. 1952 No. 1554), which took effect on 25th August (H.M. Stationery Office, 2d), revises the prices of certain qualities of alloy steel and stainless steel products to take account, among other factors, of the changes in production caused by measures taken to conserve nickel and molybdenum and of increases in the prices of alloy materials. The Order also removes blast furnace ferro-manganese from statutory control. The price will in future be fixed by agreement between the makers and the Minister of Supply.

A.S.E.E. Branch Merit Competition

The Executive Council of the Association of Supervising Electrical Engineers announces that the silver branch merit cup has been awarded to the South-West London Branch in the 1951–52 competition. This Branch gained the highest combined marks for the best all-round record of activities for the 1951–52 session. Nottingham and Leeds Branches tied for second place. The examiners were Mr. L. L. Emmett, national chairman, Mr. J. Flood, vice-chairman, Mr. E. J. Sutton, hon. treasurer, and Mr. J. Freer, chairman of the Organization Committee.

Airport Hangar Lighting

What are probably the most modern hangars in the world are now in course of construction for British European Airways at London Airport. Four out of a total of ten are at present complete. The hangars take the form of two groups of five with no dividing partitions, thus providing an uninterrupted floor space of 99,000 sq ft about 900ft long. The hangars are illuminated by cold cathode fluorescent lighting fittings made by Ionlite, Ltd., a subsidiary of Falk, Stadelmann & Co., Ltd. This installation is in continuous rows under each roof beam at a height of 40ft above floor level. Shadowless



One of the hangars at London Airport illuminated by "Ionlite" fluorescent fittings

light is obtained for the whole area of an intensity of about 25 ft-candles at floor level, and there is no trouble due to specular reflection from the aircraft surfaces. Work can be carried out to the underside of the aircraft wings without local lighting. The consulting engineers were Scott & Wilson, and Barlow Leslie & Partners.

Purchase Tax on Loudspeakers

After consultation with the Radio Industry Council, the Commissioners of Customs and Excise have decided that loudspeakers of other than the cone type, e.g., pressure units, are not chargeable with purchase tax, being regarded as outside the scope of Group 18 (a) of the Tax Schedule as amended by the Purchase Tax (No. 2) Order, 1952. All separately supplied cone type loudspeakers (whether mounted or not) of sizes up to and including 12in nominal diameter are subject to tax, regardless of the purpose for which they are supplied.

The tax does not apply to loudspeakers supplied as parts of a complete public address or communication system. The liability to tax of replacement or additional loudspeakers for such installations will be determined in accordance with the preceding paragraph. Loudspeakers incorporated in receiving sets are not separately chargeable with tax, but the tax value of a chargeable set must continue to include the value of any incorporated loudspeaker.

Tool Makers' Publications

The Gauge and Tool Makers' Association has published a fifth edition of its "Members' Handbook and Buyers' Guide Index," which is available on application to the Association's offices at Standbrook House, Old Bond Street, London, W.1. Many hundreds of copies are being circulated to actual and potential buyers of tools and gauges in the automobile, aircraft, general engineering, plastics, machine tool, sheet metal, and allied industries, and a number of requests have been received from overseas.

The Association has issued a second edition of a comprehensive brochure giving details of the customs duties and taxes levied in the principal world markets upon the importation of tools and gauges. This includes the decisions taken at the Torquay Conference on tariffs. The countries dealt with include those in Europe, the Middle East, Far East, Latin America, Africa and Australasia, India, Pakistan, Canada and the United States. The brochure can be obtained from the Association, price 10s post free.

Indian Foreign Trade

A record total of overseas trade by India during the financial year 1951–52 is reported by *Indian Trade and Industry*. On the export side shipments of mica rose from £5·14 million in 1949–50 and £7·48 million in 1950–51 to £9·91 million and sales of lac from £6·06 million in 1949–50 and £8·86 million in 1950–51 to £11·13 million.

Imports of electrical machinery were valued at £12·15 million and of electrical instruments at £7·77 million.

Marconi House, Aberdeen

The new Aberdeen depot premises of the Marconi International Marine Communication Co., Ltd., at Regent Road, were inspected by representatives of Scottish fishing interests on 29th August. Mr. H. C. Van de Velde, deputy to the managing director of the Marconi Marine Company, and Mr. Ronald Ferguson, general manager, were present to meet visitors, who were welcomed by Mr. V. G. Oastler, manager of the Aberdeen depot. Conveniently situated close to the fish dock, the new depot is a two-storey building, with the ground floor given over to main storage space, storekeeper's office and battery maintenance room, with a vehicle bay for direct loading and unloading.

The floor above holds the depot manager's and assistant depot manager's offices and the general office. The technical staff are also accommodated on this floor. Next to these rooms are the repair shops and storage space for light equipment, connected with the main store on the floor below by means of a ¼ ton electrical hoist.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £157 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £132 10s 0d
Foreign	ton £131 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £957 0s 0d
ZINC, G.O.B. Foreign	ton £122 0s 0d
Electrolytic	ton £126 0s 0d
BRASS Tubes	lb 2s 3¼d
Sheet	lb 2s 6d
Wire	lb 2s 9d
PHOSPHOR BRONZE	
Wire	lb 4s 1½d
RUBBER, No. 1 R.S.S. spot ..	lb 23¼–23½d

Heaton Works Strike

The strike of building trade workers engaged on the new research building at C. A. Parsons & Co.'s Heaton, Newcastle-on-Tyne, works has been referred to a National Disputes Commission. About 300 men are involved in the stoppage, which concerns an alleged non-union worker. The man concerned offered to stay

away from work while the validity of his union card was investigated, so that the strikers could return to work. Neither Stephen Easten, Ltd., the building contractors, nor C. A. Parsons would agree to this proposal, and the stoppage continued.

British Plastics Exhibition

The second British Plastics Exhibition and Convention will be held at Olympia, London, from 3rd to 13th June, 1953, opening on the day following the Coronation. The Exhibition will occupy the whole of the National Hall, Olympia. As a result of the success of the first Exhibition in 1951 over 82 per cent of the space has already been applied for by 78 firms, including 28 suppliers of raw materials, 24 fabricators and moulders and 19 plant manufacturers.

The Convention held in conjunction with the Exhibition will be on the same basis as in 1951 with discussions of papers, presented by leading authorities, on the most recent developments and rapidly developing materials in the industry. The organizers are, as before, *British Plastics* (Associated Iliffe Press, Dorset House, Stamford Street, London, S.E.1) with the co-operation of the British Plastics Federation, the Plastics Institute and the Plastics and Polymer group of the Society of Chemical Industry.

Tool Company's Extensions

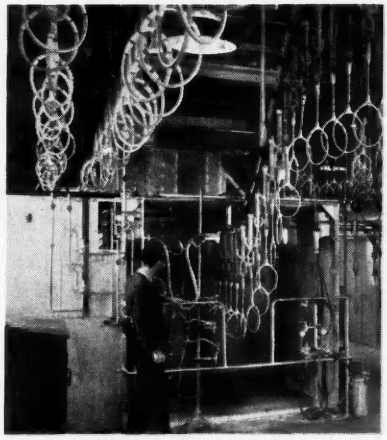
Reconstruction and enlargement of its premises have been carried out by the High Speed Service Tool Co., Ltd., which have doubled its output of press-tools, jigs and fixtures. The services which the company renders to the electrical industry are very wide, ranging from radio to refrigerators, teleprinters and the like.

Telephone Battery Orders

The Alton Battery Co., Ltd., has been given a contract for replating two 12,470 Ah batteries in London which, originally installed by the company in 1926, form one of the largest telephone battery installations in the country. Other contracts include batteries from 800 to 5,000 Ah capacity for installation in telephone exchanges at Manchester, Portobello, Liverpool, Leeds, Glasgow, Edinburgh and Wrexham. Export orders in hand cover batteries of capacities up to 6,970 Ah for shipment to twenty-one countries.

Spraying Tennis Rackets

An electrostatic spray plant has been installed at the Dunlop tennis racket factory, Waltham Abbey. As the racket frames are carried on a conveyor through an electrode system charged at 130,000 V the lacquer particles pick up a charge of their own. At this high voltage there is enough moisture in the wooden frames for them to act as conductors and they therefore attract from all directions lacquer particles, 40 per cent of which, with ordinary hand spraying, would have passed out of the plant and been wasted.



The electrostatic spray plant at Dunlop's tennis racket factory

E.T.U. at Radio Show

This year, for the first time, the Electrical Trades Union has a stand at the National Radio and Television Exhibition at Earls Court. Illuminated panels illustrate the scope of the organization and the services it provides for its members, notably the convalescent home at Rustington and the new training college to be opened shortly at Esher.

Trade Announcements

The store of the **Edison Swan Electric Co., Ltd.**, Taunton, has been transferred from 36, Bridge Street, to Priory Bridge Road. The telephone number is unchanged and the store will continue to be controlled from Ediswan Bristol office.

Montclare & James, Ltd., 120, Barons Court Road, London, W.14, have been appointed sole United Kingdom agents for the Compagnie Générale de Métrologie, France, and now have available the latest catalogue of " Metrix " instruments.

The **Agro Electrical Co., Ltd.**, has appointed Uppington & Son, St. James' Parade, Horsefair, Bristol, 1, as its agents for the counties of Gloucester, Somerset, Wilts, Devon, Cornwall and Dorset.

Mr. W. O. Jackson, Associate I.E.E., London representative of G. P. Dennis, Ltd., has been appointed technical sales representative with **W. Lucy & Co., Ltd.**, as from 1st

September. While he will be concerned with the sales of all the company's electrical distribution products in part of the London area and the Eastern Counties, the primary object of his appointment is to undertake the development of sales of Lucy industrial switch and fuse gear throughout the country. Mr. Jackson will operate from his home, 54, Monk's Avenue, New Barnet, Herts (telephone : Barnet 4578).

Outdoor Boxing at Nottingham

Referring to the note on this event published in our issue of 25th July (p. 198), Broadcast Relay Service, Ltd., tells us that the sound equipment was installed by a member of that group—Rediffusion (East Midlands), Ltd.

Catalogues and Lists

Crompton Parkinson, Ltd., Crompton House, Aldwych, W.C.2.—Illustrated leaflets giving full dimensions and particulars of two new fluorescent lighting fittings : the "Abbey" (two 80 W 5ft tubes) and the "Alton" (one 80 W 5ft tube).

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Illustrated leaflet dealing with the 40/60 W non-flameproof prismatic bulkhead unit.

Redfern's Rubber Works, Ltd., Hyde, Cheshire.—Illustrated folder on extruded sections in natural and synthetic rubbers.

H.V.E. (Electric), Ltd., Rodley, Leeds.—Illustrated priced folder on "Thermalair" tubular heaters, convectors and fan heaters.

Knightshades, Ltd., Derby Road Works, Montagu Road, Edmonton, London, N.18.—New season's list illustrating range of table lamps, fittings, bedlights and lampshades (54).

Birlec, Ltd., Tyburn Road, Erdington, Birmingham, 24.—Three illustrated leaflets dealing with humidity control, production brazing and soldering, and induction heating in the forge.

Crompton Lamp Publicity

In our last issue we illustrated a new counter card forming part of Crompton Parkinson's lamp publicity for the coming season. This was inadvertently described as a picture of the new poster. Although the same theme is used for the poster it is of a somewhat simpler design.

THE LIGHTING SEASON

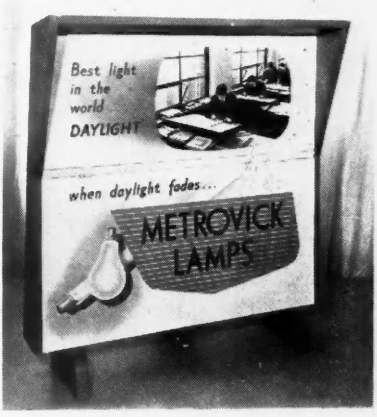
New Publicity Material Available

IN its autumn advertising the Metropolitan-Vickers Electrical Co., Ltd., has coupled an acknowledgment that the best light is daylight with its familiar slogan "When Daylight Fades . . . Metrovick Lamps." This is attractively employed in a large cutout in full colour 32in high and on a showcard replica of the cutout. A new idea in window displays dispenses with the need for additional crates by its "portmanteau" construction. These units, measuring 36in by 42in high, can be used singly or in a group of four.

In Press advertising the "quality control" theme started last autumn has been continued, with further illustrations of the care which is taken to produce consistently high quality lamps. A new edition of the company's lamp catalogue and pin-up price folder are available. The cover design on both of these publications emphasizes that the electric lamp, taken for granted by nearly everybody, requires great skill and precision in its manufacture. An attractive folding display unit and priced broadsheet have been produced in connection with the new range of Metrovick fluorescent fittings introduced last September.

There is also a new street lighting catalogue with details of the complete range of Metrovick lanterns. An industrial catalogue will be available later this year and in preparation

Metrovick "portmanteau" display unit



is a new publication with details of lamps and lighting equipment suitable for next year's Coronation celebrations.

Mazda Programme

Plans by the British Thomson-Houston Co., Ltd., for "Mazda" advertising during the coming season embrace several innovations. A new 16-page booklet in two colours has been produced entitled "Lighting to Measure." This will be available to the trade for free distribution to the public. It contains a number of illustrated lighting "recipes" advising the householder of the type of lamp to use and where to place it in order to obtain maximum benefit. Advertisements will appear regularly in the majority of national daily newspapers and will take the form of rhymed couplets in humorous vein illustrated by well-known artists. This season more extensive use will also be made of local newspapers.

Large silk-screen displays have been produced for dressing windows. One design is in the form of a house with cutaway windows and will be used to advertise the booklet "Lighting to Measure." Another follows the theme of a rhymed newspaper advertisement and a third is a three-fold screen with the "Mazda" dancing girl in full colour coupled with the slogan "Mazda Lamps Stay Brighter Longer." A new paper window pelmet has also been produced.

There will be ten new showcards advertising different types of lamps. These include a new type of showcard which will also act as a dispenser for lamps. There is also a mobile display consisting of lamp shapes suspended from a cardboard roof which can be affixed to any vertical surface. A shaped cutout showcard carries three lamps and there will be three miniature showcards based on coloured versions of the newspaper advertisements.

A new comprehensive "Mazda" lamp catalogue has been printed. This has a full-colour cover and centre-spread, and carries two colours throughout its 56 pages. An additional catalogue of projector, photographic and special lamps is also being produced for publication later in the season. Other literature includes a special instruction booklet on how to make the best use of photoflash lamps. A new hanging sign has been designed which can be supplied unlighted or with a special louvred canopy to house two 2ft fluorescent lamps. The sign has relief lettering and a full-colour "Mazda" dancing girl in moulded relief.

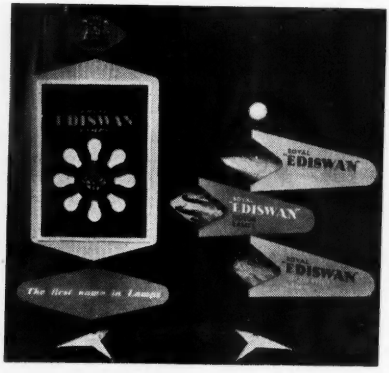
One of the new "Mazda" showcards

Edison Swan Material

Lamp advertising by the Edison Swan Electric Co., Ltd., for the coming season will include a new design for dealer window displays of an adaptable nature to cover the requirements of varying window areas. The display comprises three units each of which can be used as a complete display piece or as double or treble displays. This unit is adaptable to the display of various types of lamps. The centre motif is produced also as a poster and showcard.

Illuminated box signs, bus sides and prestige advertising in the general and trade Press complete the campaign for the 1952–53 lighting season.

An Ediswan window display unit



Insulating Tubes

THE electrical and mechanical properties required of synthetic-resin bonded paper insulating tubes of rectangular cross section for power circuits up to 1,000 V are specified in B.S. 1885, which is new and, apart from the voltage limitation, is complementary to B.S. 1314 (1946) which covers circular tubes of similar material. Two types are dealt with: for d.c. and for a.c. at up to 100 c/s respectively with internal side dimensions ranging from $\frac{1}{4}$ to 6in and wall thicknesses of from $\frac{1}{32}$ to $\frac{1}{2}$in. Methods of testing such tubes are specified in an appendix. Copies are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 2s 6d post free.

Industrial Electronics

Latest Techniques Surveyed at Four-Day Symposium

ON Tuesday last the fourth symposium and exhibition to be organized by the Scientific Instrument Manufacturers' Association (S.I.M.A.) was opened at the Examination Hall, Queen Square, London, W.C.1. It will be remembered that the nature of this annual gathering, as it was originally envisaged in 1948, was modified last year in view of the inauguration of a new series of instrument exhibitions, the British Instrument Industries Exhibition organized jointly by S.I.M.A. and a group of sister associations. In future the symposium and instrument exhibition will take place biennially and complementally.

At the present function a series of seven technical papers are being read by specialist scientists and engineers and there is also a comprehensive display of the latest types of British scientific and electronic instruments, most of which are shown in operation. Altogether 18 firms are taking part in the display.

Control of Large Telescopes

The opening ceremony took place under the chairmanship of Mr. A. W. Smith on Tuesday afternoon, after which a paper on electronic control systems for large astronomical telescopes was presented by Messrs. G. H. Hickling and A. Gray (Sir Howard Grubb, Parsons & Co.).

The paper opened with a discussion of the astronomical factors leading to the requirement of very accurate control of "rate" in the drives for large telescopes. This was followed by a review of the techniques employed to achieve this end. The present forms of electronic control have developed from methods based on the pendulum clock and the later use of tuning forks as the standard of reference, while to-day the quartz crystal with a frequency stability of the order of 1 in 10^8 is the best known and most accurate standard of reference. A modern requirement is the ability to introduce small variations of rate, and to provide for this very stable "R–C tuned" oscillators are used, either as the source of reference frequency or as a means of introducing frequency variation in a crystal controlled source.

Referring to photoelectric methods of control, the authors illustrated the application of these principles to telescope drive systems by describing various recent projects, including reflectors up to 74in aperture and a "Photographic Zenith Tube" shortly to be installed in this country to provide a new standard of absolute time determination.

Resistor Development

On Wednesday morning, when Mr. E. D. Hart took the chair, Mr. J. M. Herbert (Plessey Co.) dealt with the development of resistive elements and wave-guide attenuators from a semi-conducting ceramic. In contrast to most semi-conductors the temperature coefficient of resistivity of pure zinc oxide can be controlled between high positive and negative values. The addition of titanium dioxide makes it possible to achieve this control with commercially available materials, and to control the value of resistivity. Small resistors of up to 10,000 ohms with tolerances and stability similar to grade B carbon composition resistors have been made and can be run with surface temperatures up to 200 deg C. It has not been possible to manufacture small sizes because of the difficulty of making an electrical connection to small pieces; large resistors for running in series with valve filaments can be made satisfactorily.

Elements with very high positive temperature coefficients of resistance can be used as current regulators where the supply voltage is variable. The control is not as good as that given by an iron wire in hydrogen barretter, but it might have practical uses. The material has proved very satisfactory in the manufacture of dummy loads to fit in metal wave guides as it is unaffected by rapid temperature changes and combines high attenuation with a good match. It is also being developed in the form of attenuator vanes.

The next paper, which dealt with electronics in strain measurement, was presented

by Messrs. D. L. Johnston and D. W. Hobbs (Elliott Brothers). This paper gave a general introduction to the electrical strain gauge and its applications in the measurement of stress or strain. It included the description, performance and uses of various electronic instruments which have been designed to meet the growing demands of research and industry in these fields, such as multi-channel strain display equipment, high speed self-balancing strain bridges and load indicators, load cells and torque meters.

In the afternoon Mr. W. Bamford was chairman and Dr. G. Mole (E.R.A.) surveyed a selection of the electronic instruments which have been developed for research purposes in the E.R.A. laboratories. Some of these have to satisfy special requirements to render them suitable for the testing of heavy power electrical equipment. Their functions include the control of the operation of high power switch-testing circuits, the measurement of a wide variety of characteristics of interest in the operation of power-transmission systems, and simulation of the behaviour of complex networks particularly under transient conditions.

Process Controller

When Mr. J. H. Reyner took the chair on Thursday morning Mr. J. R. Boundy (Evershed & Vignoles) described an electronically operated process controller and its associated apparatus. Firstly, he outlined a form of convertor for changing the various physical quantities to be measured, such as level, pressure, flow, etc., into a d.c. current varying from 0 to 30 mA in accordance with the changes in the measured quantity.

The three modes of operation of the standard arrangement of process controllers were mentioned, together with the detailed circuit arrangements of this particular controller. The d.c. output from the controller is used to position the orthodox pneumatically operated process control valve by means of an electro-pneumatic relay mounted on the valve. Some of the advantages claimed for the use of an electrical method were also given.

The subject of a paper presented by Messrs. D. K. Das Gupta and R. J. Russell-Bates (Elliott Brothers) was electronics in temperature control. Automatic control necessitates precise measurement of temperature and in general employs a closed loop or feed-back system by which output is continuously compared with a predetermined set point and any difference between the two is automatically corrected. The paper contained a survey of the applications of electronics to temperature measuring and controlling devices and an assessment of associated regulating devices such as transformer voltage taps, continuously variable transformers, saturable reactors and thyratron control.

The final paper was presented in the afternoon by Dr. B. E. Noltingk (Mullard Research Laboratories) with Mr. P. Gasper in the chair. It dealt with the application of high power ultrasonics, gave a summary of the present position, and showed how far different projects have progressed. Applications were considered which involved the dispersion of one material in another, such as emulsification and the production of finely divided suspensions. The action of cleaning was concerned with the same principle, and the use of ultrasonics had been proposed both for scouring textiles and for the removal of foreign matter from solid bodies. All these effects followed from the phenomenon of cavitation, which also made possible the ultrasonic tinning of aluminium. Other metallurgical applications included degassing melts and grain refinement. Most chemical effects occurred only at very slow reaction rates, but ultrasonic depolymerization had been widely studied. In the biological field, micro-organisms had been destroyed, and striking therapeutic results claimed for ultrasonics. An important recent application was the use of ultrasonic vibrations for drilling hard materials.

The final session of the symposium takes place to-day (Friday) under the chairmanship of Mr. A. J. Philpott, when there will be a " User Forum " and a summing up of the week's proceedings.

Evening Courses

THE 1952–53 session at the Polytechnic, Regent Street, London, W.1, commences on 22nd September, and the prospectus is now available of evening courses in electrical engineering, including telecommunications.

Particulars of part-time (day and evening) courses in engineering (including electrical engineering) are given in the prospectus of the Northampton Polytechnic, St. John Street, London, E.C.1, which is now available. The 1952–53 session begins on 22nd September.

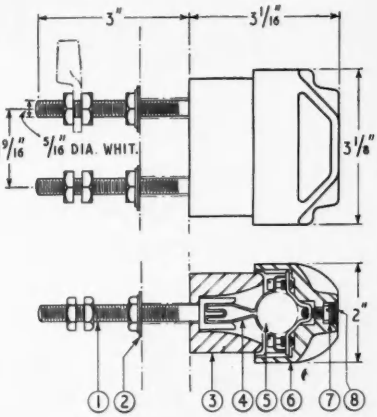
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Panel-mounting Fuse Units

ANOTHER useful addition made by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Hatton Garden, London, E.C.1, to their range of distribution equipment are fuse units for panel mounting (List No. 39070).

These units, one of which is shown in the accompanying drawing, are designed for 440 V and to accommodate 15 A, 30 A, 45 A or 60 A cartridge fuse-links. Back connections are provided. The units are supplied unmounted complete with stems and nuts but without cable sockets and cartridge fuse-links, which are obtainable separately.



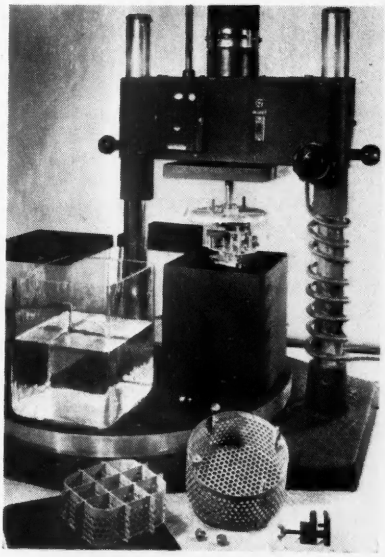
Henley panel-mounting fuse unit
1. Contact block and stem with nuts. 2. Brass and micanite washers. 3. Porcelain base. 4. Contact clip. 5. Cartridge fuse-link. 6. Carrier. 7. Insulating disc with porcelain seal

Mechanism Cleaner

The NORTHERN SCIENTIFIC EQUIPMENT, LTD., Bark Street, Bolton, Lancs, has produced the Type B RST Series 1 mechanism cleaner for dealing with all kinds of mechanical and electrical parts, such as meter and clock gearing, etc.

The machine is mounted on a substantial cast aluminium base, about 3ft in diameter, in which are fitted two chromium plated tubular steel pillars. Sliding up and down on these pillars is a rigid cast aluminium girder structure forming a head unit which carries a $\frac{1}{6}$ h.p. motor with push-button starter, fuses and neon indicator lamp. A hand lever on the brushgear gives a wide speed range. The motor is connected through a reduction gear and shock-absorbing clutch to a massive vertical spindle, running in roller bearings, to the bottom end of which is fitted a faceplate with holes to take the fixing studs of the work basket and slots to accommodate clamps by which a complete mechanism may be fastened to the machine. The cadmium-plated perforated-steel work basket is about 8in in diameter and 4in deep and has removable subdivisions. It runs at a speed of about 120 r.p.m. when immersed in the cleaning solution. The head unit is spring counterbalanced and easily moved and clamped in position. Three rectangular glass tanks and a rectangular drying box are provided. A small electric heating element is automatically switched on.

All this equipment forms a self-contained unit 3ft wide, 3ft 9in long and 3ft high finished in crackle black and chromium. Its total rating, including the heater, is about 600 W; the net



Right: **N.S.E. mechanism cleaner**

weight (dry) is about 200 lb. The machine is distributed by John Baggs Technical Services, Uppermill, Oldham, Lancs.

Water Boiling Urns

A range of water boiling urns suitable for use in catering establishments is now being made in 3, 6 and 10 gallon sizes by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

They are constructed of heavy gauge copper with tinned interiors and polished copper exteriors. Water is heated by easily replaceable sheathed wire immersion heaters, each protected from failure due to boiling dry by its own push-button reset cut-out device.

Each urn is provided with three-heat control, a full bore draw-off tap and a gauge glass. The urns are loaded at 3, 6 and 9 kW respectively and priced at £25 19s, £32 16s and £42 4s.

U.V. Lighting Equipment

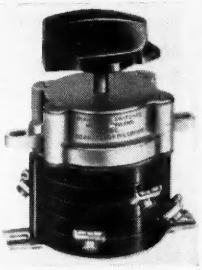
A range of ultra-violet lighting equipment for a.c. mains operation has just been brought out by the MAJOR EQUIPMENT CO., LTD., 22, Gorst Road, London, N.W.10. The illuminant is a grid of cold cathode tubing behind a u.v. glass filter. Starting is instantaneous and effective dimming can be achieved.

At present four fittings are available; a 120 W flood, a 300 W batten and 80 W and 100 W display units. In all models the life of the grid is about 7,000 hours. The transformer and grid are totally enclosed and a protective guard is fixed over the filter screen.

The output characteristic differs from that of the 125 W u.v. lamp; there is a more even distribution of "black light," a far greater spread, and the units operate on a peak emission wavelength of 3,650 Angstroms. Although primarily intended for indoor use these fittings can be supplied with a weatherproof finish.

Rotary Switch

A heavy duty rotary packet switch which has been brought out by "DIAMOND H" SWITCHES, LTD., Gunnersbury Avenue, Chiswick, W.4, is rated at 30 A 250 V or 17 A 440 V a.c./d.c. and can be supplied for either panel or base mounting. Special features which have been incorporated in the new switch ensure long mechanical and electrical life.



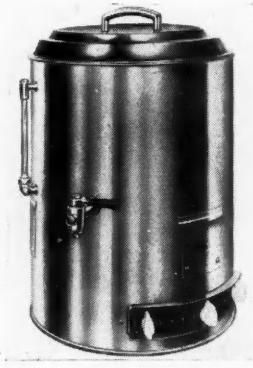
"Diamond H" rotary packet switch

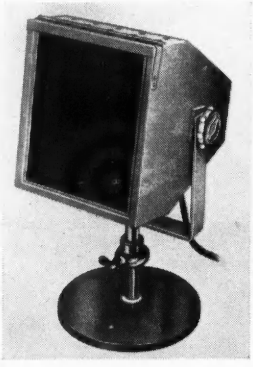
Ironclad Service Fuses

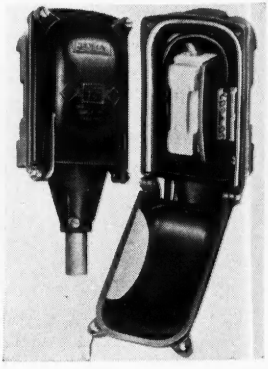
Two ironclad service fuses for use in lighting columns where the restricted space and working conditions call for a robust weatherproof assembly have been added to the range of distribution equipment made by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., 51–53, Hatton Garden, London, E.C.1. The single entry type (ISCO CV) is only 3·75in wide and is fitted with one fuseway suitable for wire fuse element or cartridge fuse link and a single-way neutral. The detachable sealing chamber has a brass wiping gland; it is suitable for 0·0145 sq in incoming and outgoing conductors.

The loop-in type (ISCO CW) is fitted with the same fuse unit as the single-entry model, is 5·75in wide and is suitable for three twin cables or one twin and one three-core cable incoming, and 0·0145 sq in v.i.r. tails outgoing. In both models the tails are taken out through the lower side of the case but if required they can be taken out through conduit screwed into the boss at the top of the case.

Left : **G.E.C. water boiling urn.** *Centre :* **Ultra-violet floodlight fitting by the Major Equipment Co., Ltd.** *Right :* **Henley single-entry ironclad service fuse**







FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Hackbridge Cable Holdings, Ltd., reports a consolidated trading profit for the year ended 31st March last, after providing for depreciation, etc., of £177,912, as compared with £193,417 for the preceding year. Taxation requires £90,903, leaving a net profit of £87,009 (against £71,247), to which is added £3,524 brought in, making £90,533 available. It is proposed to pay a final ordinary dividend of 12½ per cent, maintaining the distribution for the year at 20 per cent, a sum of £27,965 is retained by subsidiary companies, and £3,505 is carried forward.

In his statement, Mr. C. I. Steen (chairman) says that the past year has seen a continued rise in the cost of raw materials and in the provision of essential services and supplies. The tendency of costs is still upwards, but in the case of certain raw materials prices are tending to fall and the supply position is also improving. At present they have a good volume of work in hand and in prospect. The current year has commenced favourably and the monetary value of the turnover is again substantially up. During the year they inaugurated an efficiency bonus scheme for all employees.

Britannia Electric Lamp Works, Ltd., reports a trading profit for the year to 31st March last of £130,179, as compared with £134,098 for 1950-51. After meeting all charges, including £64,873 for taxation, there is a net profit of £38,745 (against £50,356). General reserve receives £8,750 and it is proposed to maintain the dividend for the year at 12½ per cent. The balance carried forward is £62,495 (against £46,192).

Richardsons, Westgarth & Co., Ltd., report a consolidated trading profit for the year to 31st March last of £814,568, as compared with £682,990 for the preceding year, and after deducting £88,458 for depreciation, £479,470 for taxation, and £1,410 retained by subsidiaries, the parent company's net profit is £247,361 (against £240,851). Reserves receive £175,000, and as already announced, the dividend for the year is unchanged at 12 per cent. The balance carried forward is £122,208 (against £133,449 brought in).

The British Thermostat Co., Ltd., has declared an interim dividend of 7½ per cent (unchanged).

New Companies

Electronic Assemblies, Ltd.—Registered 2nd August. Capital £100. To carry on the business of the assembling and wiring of all electrical units, etc. Directors: F. R. Shearman, A. D. Shearman and J. Shearman. Secretary: A. O. Shearman. Regd. office: 223, Whittington Road, N.22.

A. Roberts & Co. (Balham), Ltd.—Registered 31st July. Capital £2,000. Manufacturers and dealers in electrical and mechanical apparatus, radio sets, etc. Directors: J. W. Lightfoot (permanent), Georgina B. Lightfoot (permanent) and R. G. Lightfoot. Regd. office: 57, Bedford Hill, Balham, S.W.12.

Harry Davis Co. (Kidderminster), Ltd.—Registered 8th August. Capital £1,000. To acquire the business of an electrical consultant and contractor carried on by H. Davis, at Kidderminster, as the Harry Davis Co. Directors: H. Davis and C. Davis. Regd. office: 4, Lion Street, Kidderminster, Worcs.

Electrical Thermometer Co., Ltd.—Registered 12th August. Capital £100. Electrical engineers and contractors, etc. Directors: R. S. Evenden and W. F. Cook. Regd. office: 1, Stroud Green Road, Finsbury Park, N.4.

Harris & Soneya, Ltd.—Registered 31st July. Capital £100. Manufacturers and dealers in electric lamps and shades, electrical appliances, etc. Directors: M. Harris and J. Soneya. Secretary: Maurice Harris. Regd. office: 7, Vigo Street, W.1.

Ladbroke Rewind Service, Ltd.—Registered 19th August. Capital £100. Electrical equipment specialists, etc. Directors: G. F. Wright, G. W. L. Devine and L. A. Clilverd. Secretary: G. W. L. Devine. Regd. office: 820a, Harrow Road, Kensal Green, N.W.10.

Cema Electrics, Ltd.—Registered 14th August. Capital £3,000. Electrical, mechanical, radio and television engineers and contractors, etc. Directors: A. A. Silberstein and M. Goldstein. Regd. office: 32, Portland Avenue, N.16.

F. H. Wheeler (Newcastle), Ltd.—Registered 8th August. Capital £1,000. Electrical contractors and engineers, manufacturers and repairers of and dealers in dynamos, motors, armatures, etc. Directors:

F. H. Wheeler, F. Harrington and A. J. K. Parker. Solicitors : Neal, Scorah, Siddons & Co., Sheffield.

Ultra Voltage Transmission, Ltd.—Registered 25th August. Capital £1,500. To carry out research upon, experiment in and develop processes or inventions for the transmission of electrical energy, and in particular electrical energy at high voltages, etc. Directors : D. A. O'Duffy, N. F. Phillips and H. P. M. Reay. Solicitors : Garland Wells & Co., Donington House, Norfolk Street, W.C.2.

Liquidation

Arthur Bailhache, Ltd., electrical contractors, Central Avenue, West Molesey, Surrey.—Winding up voluntarily. Liquidator, Mr. S. J. Collier, 99, Elgar Avenue, Tolworth, Surrey, appointed 20th August.

Bankruptcies

W. P. Wann, carrying on business at Grape Lane, York, as "Electricity Service," formerly carrying on business at 41a, Petergate, and Grape Lane, York, electrical engineer.—Receiving order made 21st August on debtor's own petition.

R. T. Thornton, carrying on business as "Lustre Products" at Bedcote Works, Birmingham Street, Stourbridge, Worcs, electric switch block manufacturer.—Receiving order made 8th May, 1952, rescinded on 22nd May. Debts and costs paid in full.

E. S. Humphreys, carrying on business at 73, Pool Street, Caernarvon, radio and television retailer.—Receiving order made 22nd August on debtor's own petition. First meeting 5th September at the Official Receiver's office, West Africa House, 25, Water Street, Liverpool, 2. Public examination 26th September at the Court House, Deiniol Road, Bangor.

F. J. Crutchley, carrying on business at 9, York Street, Hulme, Manchester, and lately carrying on business at 304, Deansgate, Manchester, electrical engineer.—Receiving order made 27th August on debtor's own petition.

J. G. Milne, carrying on business at 34, Whitworth Road, Grangetown, Yorks, radio and electrical dealer.—Trustee, Mr. C. G. Sparrow, 62-63, High Street, Stockton-on-Tees, appointed 23rd August.

D. N. Bateman, residing and lately carrying on business under the style of "Villiers Electric" at 1, North Villiers Street, Leamington Spa, radio and electrical engineer.—Supplemental dividend of 8⅝d in the £, payable on and after 20th September at the office of the Official Receiver in Bankruptcy, Somerset House, 37, Temple Street, Birmingham, 2.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates mentioned:—

20th September

SEW-TRIC. No. 707,652. Class 7. Electric motors included in Class 7, sewing machines and parts and fittings, all included in Class 7, for all the aforesaid goods.—Sew-Tric, Ltd., Sew-Tric House, Honeypot Lane, Stanmore, Middx.

ADVANCE. No. 696,927. Class 9. Electric resistance metals in the form of wire, rod, strip or sheet.—British Driver-Harris Co., Ltd., Gaythorn Mill, Albion Street, Manchester, 15.

No. B705,191 (design). Class 9. Electrical resistances, and condensers, suppressors, potentiometers and volume controls, all being electrical apparatus.—Erie Resistor, Ltd., 2, Carlisle Road, The Hyde, Hendon, London, N.W.9.

DAVU (design). No. 705,445. Class 9. Electric cables and insulated electric wires.—J. Day & Co. (Derby Works), Ltd., Harrow Manor Way, Abbey Wood, London, S.E.2.

TYANA. No. 708,559. Class 9. Electric soldering irons and parts thereof included in Class 9. R. E. Pickstone, Ltd., 56–60, Islington Park Street, London, N.1.

27th September

MARCONI (design). No. 686,989. Class 9. Wireless telegraphic transmitting apparatus; wireless telegraphic and telephonic transmitting and receiving apparatus for use in communications for tolls; complete wireless telegraphic and telephonic transmitting and receiving installations in ships and aircraft, primarily intended for navigational purposes; thermionic valves for all the aforesaid apparatus supplied to the constructors but not through retail shops to the purchaser or user; electrical apparatus and instruments for measuring electrical, physical and chemical characteristics and properties and for deriving therefrom indications, records, and controls.—Marconi's Wireless Telegraph Co., Ltd., Electra House, Victoria Embankment, London, W.C.2.

BUSH. No. 698,627. Class 9. Wireless receiving sets, radiogramophones, television receiving sets and combined wireless and television receiving sets.—Bush Radio, Ltd., Albion House, 59, New Oxford Street, London, W.C.1.

BIVAC. No. 700,427. Class 9. Electric vacuum cleaning apparatus for industrial purposes.—Bivac Air Co., Ltd., Beehive Mill, Marsland Street, Portwood, Stockport.

STOP COTE. No. 702,382. Class 9. Electronically operated apparatus for indicating and, if necessary, automatically stopping the operation of machine tools when the work has reached a pre-determined state.—L'Electronique Appliquée a la Mécanique, France. Address for service, c/o A. A. Thornton & Co., Napier House, 24–27, High Holborn, W.C.1.

VOLTABLOC. No. 704,611. Class 9. Electric cells, batteries and accumulators.—Société des Accumulateurs Fixes et de Traction, Romainville (Seine), France. Address for service, c/o Mewburn, Ellis & Co., 70–72, Chancery Lane, London, W.C.2.

CELTIC. No. 707,434. Class 9. Electric batteries for motor vehicles.—Supac Electrical Co., Ltd., 25, Edwardsville, Treharris, Glam.

SPINNEY (design). No. 707,745. Class 9. Domestic electric cleaning apparatus, electric flat irons, electric cooking utensils included in Class 9, and photographic apparatus.—Littlewoods Mail Order Stores, Ltd., Waterloo Buildings, Cases Street, Liverpool, 1.

TELEJECTOR. No. 708,222. Class 9. Wireless and television apparatus and parts thereof included in Class 9.—P. A. Reffitt, trading as Chesterfield Radio and Television, 11, Chesterfield Street, Mayfair, London, W.1.

STOCKS and SHARES

IN both the gilt-edged and industrial sections of the Stock Exchange, prices have improved further upon the important gains secured since the middle of the year. For this, the industrial markets have very largely to thank the lead given by Government securities over the past two months or so. In correspondence with the all-round rise in gilt-edged stocks, the two senior 3 per cent British Electricity issues have risen no less than six points since the end of June. The 3½ per cents dated 1976–79 are also about six points to the good, while the long-dated 4¼ per cent issue is 2¾ up. By way of explanation, opinion remains well agreed that the main factor has been a subsidence of anxiety about the possibility of any early change in the Bank Rate, still the platform on which most security values rest. The improvement in sentiment originated with the account of national affairs given to Parliament before the summer recess, and has been assisted by the latest returns in connection with the gold reserves and the balance of trade. A mild reaction at the beginning of the week was associated with the demands for increased wages.

Radio Shares

Opening of the Radio Exhibition again stimulated interest in the investment aspect of the trade. As usual, the radio element cannot easily be segregated from the more general activities of some of the principal exhibitors: in the case of English Electric, for instance, it is as difficult for the investor to assess the importance of the radio and T.V. departments as it is to judge that of the "Canberra" in relation to the heavy electrical engineering side of the business. Even in the case of the more straightforward "radio" companies, issues are confused by their preoccupation with what is, to most people, the comparatively mysterious field of electronics. These latter activities are, however, popularly regarded as investing the shares concerned with very interesting long-term possibilities. Their importance to the defence programme is seen meanwhile as a substantial offset to the effect of purchase tax and credit restrictions on domestic radio sales.

Prices and Yields

Of the shares in companies concerned primarily with radio, television and electronics, Pye 5s deferred have an established place among the leaders, on the strength of the outstandingly consistent and progressive record of achievement and dividends. At 16s they yield, on the recently maintained dividend of 18 per cent, not much over 5½ per cent, which is in line with the return of the best of industrials. E.M.I. 10s shares are of course another favourite and generally the most active security in the group. At 16s they show a yield of 7½ per cent, with a final dividend due within a few weeks. Ekco 5s ordinary at 16s 6d give £7 11s 6d per cent, while Decca 1s shares pay 6 per cent on the money. On Murphy 5s shares at 6s the return is over 8 per cent and yields of 10 per cent or more are shown on the 5s shares of Ultra Electric at 4s 6d and McMichael Radio at 3s 6d. Cossor 5s shares have been an erratic market since the recently published dividend and annual results. Now about 9s 6d, they yield 5¼ per cent on the 10 per cent payment with which the shares re-entered the dividend list.

Dividends and Results

The 5s ordinary shares of Phœnix Telephone & Electric Holdings, a company which was made public in 1950 and has now published results for the year ended last February, are quoted at about 5s 6d. Few transactions have been recorded in recent months. New shares issued at 5s 3d since the closing of the accounts do not rank for the 10 per cent dividend which has just been declared—at the same rate as last year—but the new will be on equal terms with the old shares from now on. Group profits are shown in the preliminary statement to have improved to nearly £45,000, from which net dividends on the preference and ordinary stocks in issue, take each a total of a little under £8,000. Hackbridge Cable 5s shares have improved to 11s 3d, at which they show a yield of 8·9 per cent on the 20 per cent dividend declared last week. This is the same rate as has been paid since the shares were marketed four years ago.

Two Months' Rises

That the rise in industrial share prices over the past two months had reached genuinely substantial proportions by the end of August can be gauged by the following table of comparisons from a representative collection of electrical investments:

Ordinary Shares	Price End June	Price End Aug.	Rise
Automatic Telephone	53/9	55/–	1/3
Babcock & Wilcox	60/9	71/3	10/6
Cole, E. K.	14/3	16/6	2/3
E.M.I.	13/9	16/–	2/3
English Electric	51/6	58/–	6/6
Ever Ready	21/–	25/9	4/9
G.E.C.	76/6	85/6	9/–
Henleys	14/9	17/9	3/–
Lancs Dynamo	38/3	43/9	5/6
Reyrolle	41/–	50/–	9/–
Tube Investments	50/–	58/3	8/3
Cable & Wireless	110½	124½	14

Electrical Investments

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 1st Sept. 1952	Week's Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks				£ s d	
Brit. Elec. 1968/73	3	3	84½	+1	3 11 0
Brit. Elec. 1974/77	3	3	83½	+1½	3 11 10
Brit. Elec. 1976/79	3½	3½	90½	+1	3 17 4
Brit. Elec. 1974/79	—	4½	99⅛	+1	4 5 5
Calcutta Elec. ..	6†	6†	20/6	—	5 17 1†
East African Power	7	7	26/6	—	5 5 8
Nigerian Elec. ..	10	10	21/3	—	—
Palestine Elec. "A"	5†	5†	14/-	+6d	7 2 10†
Perak Hydro-Elec.	Nil	Nil	13/9	+6d	Nil
Equipment and Manufacturing					
Aberdare Cables (5/-)	20	20	13/9	—	7 5 6
Aerialite (1/-) ..	83½	88½	7/6	—	11 14 6
Aron Elec. Ord. ..	15	15	33/9	—	8 17 9
Assoc. Elec. Ord. ..	20	20	71/6	+2/-	5 12 0
Automatic Tel. & El.	15	15	55/-	−2/6	5 9 1
Babcock & Wilcox	18	18	71/9	+1/9	5 0 4
Baldwin, H. J. (2/-)	25	25	4/9	—	10 10 6
Bakelite (10/-) ..	—	—	17/6	—	—
British Aluminium	10	12	44/3	+1/-	5 8 6
B.I. Callender's ..	7½	9	32/6	+1/9	5 10 9
British Thermostat (5/-)	30	30	24/6	—	6 2 5
British Vac. Cleaner (5/-)	25	25	13/-	—	9 12 4
Brook Motors (10/-)	20	20	28/9	—	6 19 2
Brush Ord. (5/-) ..	10	10	6/-	+3d	8 6 8
A. F. Bulgin (1/-) ..	27½	30	2/6	—	12 0 0
Burco (5/-) ..	42½	38½	19/6	—	9 18 6
Chloride El. Storage	15	15	58/9	—	5 2 0
Cole, E. K. (5/-) ..	25	25*	16/6	+9d	7 11 6
Cossor, A. C. (5/-)	Nil	10	9/6	−6d	5 5 3
Crabtree (10/-) ..	17½	17½	35/9	+2/9	4 18 0
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9/3	+9d	6 2 0
De La Rue (5/-) ..	50	35*	12/-	—	7 12 2
Decca (1/-) ..	112½	112½	18/3	—	6 0 0
Dewhurst (2/-) ..	35	22½*	4/3	—	—
Dictograph Tel. (2/-)	20	20	4/6	—	8 17 9
E.M.I. (10/-) ..	8	12	16/-	+6d	7 10 0
Electrical Components (5/-) ..	20	20	10/-	—	10 0 0
Elec. Construction	15	15	47/6	—	6 5 3
Enfield Cable Ord.	7½	7½	21/-	—	7 2 10
English Electric ..	15	15	58/-	+2/-	5 3 6
Ericsson Tel. (5/-)	22†	22*†	41/-	+1/-	2 13 8†
Ever Ready (5/-) ..	35	35	25/9	+9d	6 16 0
Falk Stadelmann	15	15	37/-	+1/-	8 2 2
G.E.C. Ord. ..	17½	22½	85/6	+2/-	5 5 3
General Cables (5/-)	30	30	12/6	—	12 0 0
Greenwood & Batley	15	15	37/-	—	8 2 2
Hackbridge Cable (5/-)	20	20	11/3	+6d	8 17 10
Hackbridge Hewittic (5/-)	18	20	16/3	—	6 3 0
Hall Tel. Acc. (10/-)	10	10	9/9	−3d	10 5 2
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	17/9	+6d	5 12 8
Holophane (5/-) ..	15	15	10/9	—	—
Hoover (5/-) ..	37½	35*	26/-	+9d	6 14 7

Company	Dividend Previous	Dividend Last	Middle Price 1st Sept. 1952	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)				£ s d	
Intl. Combustion (5/-)	20	25	24/9	—	5 1 0
Johnson & Phillips	15	15	52/6	+6d	5 14 3
Lancashire Dynamo	22½	12½*	43/9	—	5 14 2
Laurence, Scott (5/-)	12½	15	11/9	—	6 7 8
London Elec. Wire	10	12½	48/3	−6d	5 3 9
J. Lucas	17½	7½*	35/-	+2/6	4 5 9
Marryat & S. (2/-)	22½	22½	5/-	—	9 0 0
Mather & Platt ..	12½	12½	42/6	−6d	5 17 8
Metal Industries ..	10	15	39/6	+3d	—
Mid. Elec. Mfg. ..	15	15	56/3	+⅛	5 6 8
Murex	12½	15	57/-	+½	5 5 3
Newman Ind. (2/-)	6	10	2/3	—	8 17 10
Oldham & Son (1/-)	30	35	2/9xb	—	—
Parnall (Yate) (5/-)	6	6	3/3	—	10 0 0
Parsons, C. A. ..	15	10*	50/-	—	4 0 0
Plessey (5/-) ..	20	22½	18/-	+6d	6 5 0
Pye Deferred (5/-)	18	18	16/-	—	5 12 6
Revo (10/-) ..	27½	27½	39/3	+1/-	7 8 1
Reyrolle	15	10*	50/-	+⅛	4 0 0
Scot. Cable (4/-) ..	30	32	11/9xb	—	—
Siemens Ord. ..	10	10	34/3	+9d	5 16 9
Strand Elec. (5/-) ..	17½	17½	8/9	—	10 0 0
Sturtevant (5/-) ..	16½†	17¼*†	23/6	+6d	—
Switchgear & Cowans (5/-)	22½	22½	13/9	—	8 3 8
Taylor T. (5/-) ..	20	20	20/-	—	5 0 0
T.C.C. (10/-) ..	20	20*	36/3	—	—
T.C. & M. ..	10	10	24/6	—	—
Telephone Mfg. (5/-)	10	10	8/3	+6d	6 1 3
Thorn Elec. (5/-) ..	10	12½	8/6	—	7 7 0
Tube Investments	25	25	58/9	+4/6	—
Vactric (5/-) ..	Nil	Nil	4/6	—	Nil
Veritys (5/-) ..	Nil	7½	4/9	+6d	7 18 0
Walsall Conduits (4/-)	70	70	45/-	—	—
Ward & Goldstone (5/-)	45	45*	29/-	—	—
Watford (2/-) ..	25	25	6/-	—	8 6 8
Westinghouse Brake	14	14	50/-	+2/6	5 12 0
West, Allen (5/-) ..	12½	15	10/3	—	7 6 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	4½	6	90	+10	6 13 4
Ord.	56/3	57/6	52	+2	3 12 1
Anglo-Portuguese	8	8	21/3	+6d	7 10 8
Brit. Elec. Traction: Def. Ord. ..	22½	25	425	+20	5 17 8
Cable & Wireless: Ord.	6	8	124½	+4½	6 8 6
4% Loan ..	4	4	95⅛	—	4 3 9
Calcutta Trams ..	6†	6†	23/6	—	5 2 2†
Cape Elec. Trams	4	5	12/6	—	8 0 0
Marconi Marine ..	7½	10	30/-	+2/-	6 13 4
Oriental Tel. Ord.	16	16	55/-	—	—
Telephone Props.	8	8	31/3	—	5 2 5
Tele. Rentals (5/-)	10	10	8/-	—	6 5 0

* After capital bonus.
† Dividends are paid free of Income Tax.

NEW BOOKS

The New Electrical Encyclopedia. General Editor, S. G. Blaxland Stubbs, O.B.E. Pp. 1768; figs. 2,700; plates 113. The Waverley Book Co., Ltd., 96–97, Farringdon Street, London, E.C.4. Price £8 8s the set of 4 volumes and pocket book of tables, or purchasable at subscription rates.

This, the fourth edition of this firmly established handbook of electrical practice, has been entirely rewritten and considerably expanded in the light of the substantial development in electrical science and its applications since the last edition appeared before the war. The addition of "New" to the title, therefore, seems fully warranted.

The general plan of previous issues has been followed in the arrangement of all items in alphabetical order, whether they be brief definitions or comparatively long articles, permitting quick reference or more solid reading. Nearly 100 contributors, whose names inspire confidence as authorities in their special subjects, have collaborated to convey an amount of technical information in 1¼ million words that only concise expression could make possible.

Specialist engineers of advanced attainments are more likely to find the chief advantage of the encyclopedia in the insight it gives into other spheres than their own, though references to more exhaustive treatment elsewhere of subjects of longer articles should be useful. Less experienced engineers will, however, find gathered together here a wealth of information from all sources, which has been co-ordinated by a thorough system of cross-references supported by a comprehensive index. Heavy power applications, e.g., colliery winders, and the specialized field of modern progress in telephony and telegraphy are outside the scope of the work. Reproduction on a good quality paper is excellent, the type is clear and pleasing and the numerous illustrations and plates (many in colour) are truly instructive as well as decorative.

Electric Motors and Control Gear. Edited by E. Molloy. Pp. 180; figs. and index. Geo. Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 17s 6d.

This is one of a new series of books which are being produced for the use of constructional, installation, testing and maintenance electrical engineers. The subjects covered are a.c. and d.c. motors and their control gear with, in addition, chapters devoted to amplidyne control and carbon brushes. The descriptions and explanations are clear and practical with many illustrations. Involved mathematics has been avoided.

The seven sections have been written by specialists who are to be congratulated on the large amount of information which they have been able to include, although more details could have been given of the numerous types of single-phase motors and of the characteristics of motors when subject to speed control and braking. The chapter covering carbon brushes will be useful to testing and maintenance engineers in diagnosing and remedying troubles on brushgear and the collecting gear. Perhaps the editor would consider including a chapter dealing with more general troubles on motors and control gear in a future edition.

This book is undoubtedly a valuable addition to the literature on motors and control gear.—J.L.W.

I.E.S. Lighting Handbook. Pp. 978 + xiii; numerous figs. and index. Illuminating Engineering Society, 1860, Broadway, New York, 23, N.Y., U.S.A. Price $8.

This is the second edition of the Handbook first issued five years ago. It is stated in the preface that over 75 per cent of the material is new, or revised, and this is just what might have been expected from the nature of the book and the rapidity with which developments are taking place in all branches of illuminating engineering. Although the information given is naturally based on American practice, the book will be of great value to any lighting engineer, as it brings together a vast mass of facts and figures which otherwise can only be found by a diligent search through the literature and even then are not always discoverable. Each of the 18 chapters has an extensive bibliography and, as in the first edition, the final 172 pages are occupied by manufacturers' announcements and by information supplied by them regarding the equipment they supply. There is a good index and the production generally reflects great credit on those responsible for co-ordinating the work of many experts.—J.W.T.W.

ELECTRICITY SUPPLY

Recent B.E.A. Contracts

Hydro-Electric Scheme Modified

DURING the past month the British Electricity Authority has placed contracts for equipment for power stations, transforming stations, and transmission lines, amounting in the aggregate to £6,665,970. The principal contracts include the following:—

Woolwich power station: Boiler house structural steelwork.—Redpath Brown & Co., Ltd.

Brighton "B" station: Two 320,000 lb/hr boilers.—Babcock & Wilcox, Ltd.

Littlebrook "C" station, Dartford, Kent: Coal handling plant.—Frasers & Chalmers Engineering Works.

Croydon "B" station: Raw water main and pump house.—Concrete Piling, Ltd.

Connah's Quay station, near Flint: Two 300,000 lb/hr boilers.—International Combustion, Ltd. Foundations for coal handling plant and ancillary works.—Yorkshire Hennebique Contracting Co., Ltd. 132 kV 2,500 MVA switchgear.—Ferguson, Pailin, Ltd.

Doncaster station: Auxiliary power, control and alarm cables and connections.—Enfield Cables, Ltd.

Stella North station, near Newcastle-upon-Tyne: Steel frame for turbine house, boiler house, workshops and stores buildings.—Cleveland Bridge & Engineering Co., Ltd. Six boiler feed pumps.—G. & J. Weir, Ltd.

Stella South power station: Steel frame for turbine house, boiler house, workshops and stores buildings.—Cleveland Bridge & Engineering Co., Ltd. Boiler feed pumps.—Sulzer Bros. (London), Ltd.

Staythorpe (Newark)—Drakelow (Burton-on-Trent): 275 kV twin 0·4 sq in transmission line.—W. T. Henley's Telegraph Works Co., Ltd.

Glen Moriston Scheme Alterations

By re-designing part of its Glen Moriston hydro-electric scheme, the North of Scotland Hydro-Electric Board has been able to save about 1,400 tons of steel and 25,000 tons of cement. In lower Glen Moriston there were to be a small reservoir, aqueduct and power station at Dundreggan, a larger reservoir from which water was to be led by a tunnel two miles long to a power station at Invermoriston, and a subsidiary power station at Livishie. It has been decided to dispense with the lower dam, the aqueduct and the Dundreggan station, while the station which was to have been constructed at Invermoriston will now be built underground almost vertically below the Dundreggan dam, with the turbines discharging into a tunnel leading to Invermoriston. The subsidiary station which was to have been situated at Livishie, near the lower Moriston dam, will now be built above the Dundreggan dam with the turbines discharging into the new loch formed by it. It will not now be necessary to construct a 132 kV line between Dundreggan and Invermoriston. These changes will be carried out without any effect on the annual output of the scheme, which is estimated to be about 214 million kWh. In upper Glen Moriston, where there will be two reservoirs and two power stations, work has begun on the construction of dams at the outlets of Loch Cluanie and Loch Loyne and the driving of the tunnel from Loch Cluanie to a power station near the Ceannacroc which, is also to be built underground.

Council House Services

Hastings Corporation Housing and Improvements Committee reports that negotiations have taken place with the South Eastern Electricity Board regarding the supply to the Harley Shute housing estate, following information that the capital contribution required from the Council would be £2,000. In the case of the Blacklands Farm estate, the Board agreed to reduce the capital contribution if cooker control units were installed, but this time it also requested that facilities should be provided to allow the tenants to install immersion heaters for summer water heating. Should these items be embodied in the scheme, the capital contribution would be reduced from £2,000 to £430. The Committee states that the estimated cost of adding the cooker control panel is £1 10s per house and the fittings for the immersion heater £5 per house, and as the total cost should come within the difference of £1,570 and it would be beneficial to the Council and tenants to provide the additional facilities.

Load Spreading Arrangements

At a meeting at Huddersfield last week attended by representatives of employers and trade unions it was decided to adopt the scheme of the Regional Board for a 10 per cent load reduction during the peak hours from 1st November to 31st January next. Following the meeting Councillor G. B. Jones, vice-chairman of the Huddersfield and District Committee, East and West Ridings Regional Board for Industry, said it was thought that the request could be complied with without the need to stagger working hours. If "internal spreading" was found impossible other arrangements would have to be made, but he expressed the hope that production would not be affected.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 15th October from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

615. Philips Lamps, Ltd.—Electric arc welding. 8th January, 1947. (680791.)

8243. Soc. Rateau and Anxionnaz, R.—Arrangements for balancing axial thrusts on turbo-machine rotors. 26th March, 1947. (680792.)

8537. Andre, H. G.—Electric accumulators. 28th March, 1947. (680793.)

14852. Kompfner, R., and Buckingham, J.—Electron-discharge devices. 2nd December, 1948. (680794.)

1948

2436. Standard Telephones & Cables, Ltd., Starr, A. T., Lewin, L., and Setchfield, J. B.—Electron-discharge apparatus. 21st January, 1949. (680796.)

30336. Office National d'Etudes et de Recherches Aeronautiques.—Point-to-point ultra-short wave radio links. 22nd November, 1948. (680995.)

1949

7632. Standard Telephones & Cables, Ltd.—Receivers in telecommunication systems. 21st March, 1950. (680999.)

9100. Sperry Gyroscope Co., Ltd., and Squire, A. M.—Level controlling or indicating devices. 2nd February, 1950. (680899.)

13618. Sanders & Co. (Wednesbury), Ltd., W.—Fuse carriers for electric fuse-links of the cartridge type. 22nd May, 1950. (680901.)

13894. Soc. Anon. de Télécommunications.—Voltage amplitude limiting devices. 24th May, 1949. Cognate application 13895, 12th January, 1949. (681003.)

14621. General Electric Co., Ltd., and Carmalt, L. H.—Electric hotplates. 31st May, 1950. (680806.)

16700. Gillett & Johnston, Ltd., and Lambert, D. R.—Apparatus for the control of bell-ringing. 23rd June, 1950. (680903.)

17936. Automatic Telephone & Electric Co., Ltd.—Automatic or semi-automatic telephone systems. 7th June, 1950. (680904.)

18412. General Electric Co., Ltd., and Furzey, D. A.—High-frequency electric induction heating apparatus. 15th August, 1950. (680809.)

24519. Hivac, Ltd.—Incandescent electric lamps. 6th September, 1950. (680816.)

27273. British Thomson-Houston Co., Ltd.—High-voltage electrical liquid-break circuit breakers. 24th October, 1950. (680820.)

27390. Radio-Industrie Soc. Anon.—Television transmission systems, in particular for use with low illuminations of the scene to be transmitted. 25th October, 1949. 680911.)

28919. Sless, B.—Instruments for testing the polarity of current in an electrical circuit. 11th November, 1949. (680914.)

28955. Autophone, Ltd., and Rosenfelder, R. I.—Automatic telephone exchanges. 11th November, 1949. (680822.)

29967. Electric & Musical Industries, Ltd.—Band-pass coupling circuits. 11th October, 1950. (680824.)

30454. Electric & Musical Industries, Ltd.—Cathode-ray tube apparatus. 16th November, 1950. (680916.)

31556. Dehn, S. G. (Globe-Union, Inc.).—Electric selector switch. 8th December, 1949. (680826.)

1950

204. Gardiner, L. A. J.—Compressor units for refrigerating apparatus. 8th February, 1951. (680922.)

3481. British Thomson-Houston Co., Ltd. (General Electric Co.).—Electric junction units for busbar duct systems. 10th February, 1950. (680830.)

4021. Pye, Ltd.—Television transmitting apparatus. 16th February, 1951. (680923.)

4592. General Electric Co., Ltd., and Fielding, E. A.—Knife-edge bearings and methods of manufacture thereof. 8th February, 1951. (681020.)

4969. Standard Telephones & Cables, Ltd.—Automatic level control devices for electric carrier current communication systems. 27th February, 1950. (681023.)

5078. Hoover (Washing Machines), Ltd., and Bell, W. C.—Laundering equipment. 28th February, 1951. (680926.)

7229. Scott, Inc., H. H.—Electric and electronic instruments and method of assembly. 22nd March, 1950. (680930.)

7423. Philips Electrical Industries, Ltd.—Electric-discharge tubes. 24th March, 1950. (681030.)

8930. Hawk, Ltd.—Battery-operated hand torches. 11th April, 1951. (681107.)

11566. General Electric Co., Ltd., and Rollin, L.—Manufacture of piezo-electric units. 9th May, 1951. (680934.)

12578. Mavor & Coulson, Ltd.—Loaders for coal mining and other mineral workings. 11th June, 1951. (681037.)

12844. Rushworth, D.—Method of mounting self-winding cable reels. 27th July, 1951. (680838.)

14054. Rushworth, D.—Method of supplying electric or fluid power to a power driven reciprocating carriage and/or to apparatus mounted thereon. 5th September, 1951. (680840.)

15924. Hunt, Ltd., A. H.—Manufacture of electrical capacitors. 16th April, 1951. (680843.)

16393. Standard Telephones & Cables, Ltd.—Electrical measuring circuits. 30th June, 1950. (680945.)

16700. General Electric Co., Ltd., and McKeag, A. H.—Luminescent materials. 21st June, 1951. Cognate application 7446, 30th March, 1951. (680846.)

17843. Hitchcock, S. I.—Magnetic workholders. 12th July, 1951. (680848.)

17820. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 17th July, 1950. (680852.)

18033. British Thomson-Houston Co., Ltd.—Bellows operated devices. 19th July, 1950. (680949.)

18043. Evershed & Vignoles, Ltd.—Electrical measuring indicating systems. 11th July, 1951. (680853.)

18761. Smith & Sons (England), Ltd., S., and Furzehill Laboratories, Ltd.—Automatic a.c. voltage regulator. 17th July, 1951. (680861.)

19892. Alkaline Batteries, Ltd.—Venting and pressure release arrangements of electric accumulators. 17th July, 1951. (680867.)

20378. Metropolitan-Vickers Electrical Co., Ltd.—Thermo-electric generators. 18th July, 1951. (680869.)

20463. Newton, Victor, Ltd.—X-ray apparatus. 17th August, 1950. (681050.)

20466. General Electric Co., Ltd., and Swale, D. L.—Circuit arrangements for operating cathode-ray tubes. 19th July, 1951. (681051.)

21115. Pompes Noel.—Electromagnetic clutches. 25th August, 1950. (681116.)

21608. Pirelli-General Cable Works, Ltd., and Williams, C. F.—Manufacture of electrically insulated wires and of coils or windings formed therefrom. 31st July, 1951. (680871.)

21664. Minister of Supply.—Frequency modulation radio altimeters. 11th July, 1951. (680872.)

22645. Hauss, K.—Electric circuit installations with guided current collectors. 14th September, 1950. (680956.)

23933. Siemens & Halske Akt.-Ges.—Selector switch for communication installations. 29th September, 1950. (680959.)

28051. British Thomson-Houston Co., Ltd.—Electrical discharge devices. 16th November, 1950. (680964.)

1951

2789. Plessey Co., Ltd.—Double-pole snap-action electric switch. 11th July, 1951. (680975.)

3344. Electric Storage Battery Co.—Grids of pasted electric storage battery electrodes. 12th February, 1951. (680976.)

3683. Western Electric Co., Inc.—Electrical resistors and methods of making them. 15th February, 1951. (680977.)

7954. United-Carr Fastener Corporation.—Electric lamp socket assemblies. 5th April, 1951. (681071.)

13293. Pittsburgh Consolidation Coal Co.—Method of and apparatus for converting carbon to electrical energy. 5th June, 1951. (680982.)

14861. Westinghouse Electric International Co.—Insulated bushings. 22nd June, 1951. (680890.)

16588. Siemens & Halske Akt.-Ges.—Circuit arrangement for selector switches for communication installations. 12th July, 1951. (Addition to 680959.) (680891.)

16649. Allis-Chalmers Manufacturing Co.—Totally enclosed dynamo-electric machine. 13th July, 1951. (681077.)

16661. Standard Telephones & Cables, Ltd. Electromagnetic wave-guide systems. 13th July, 1951. (680989.)

16662. Standard Telephones & Cables, Ltd.—Electrical arrangements for measuring in radio-frequency circuits. 13th July, 1951. (681078.)

16800. Philips Electrical Industries, Ltd.—Glow-discharge indicator tubes. 16th July, 1951. (680991.)

16919. Western Electric Co., Inc.—Dielectric compositions and electrical condensers containing such compositions. 17th July, 1951. (681081.)

16939. British Thomson-Houston Co., Ltd.—Door latches. 17th July, 1951. (681082.)

17062. British Thomson-Houston Co., Ltd.—Electric cables. 18th July, 1951. (681084.)

17520. United States Steel Co.—Automatic electric current control systems. 24th July, 1951. (681089.)

CANADIAN ELECTRICAL EXPORTS

A RISE of approximately 60 per cent took place in the value of Canada's electrical exports last year, compared with 1950, their total being $17,729,000. In this advance virtually all the important lines participated. The accompanying table gives the values of the principal groups and outstanding markets in 1951 with notes of increases or decreases on 1950. The wide distribution testifies to a big effort to expand exports of electrical goods.

Class of Goods	1951 $ (000)	Inc. or dec. on 1950 $ (000)	Class of Goods	1951 $ (000)	Inc. or dec. on 1950 $ (000)
Batteries, storage	650	+ 201	Meters and parts	2,380	+ 439
To Indonesia	17	+ 13	*To South Africa*	24	+ 8
„ *South Africa*	48	+ 11	„ *Brazil*	610	+ 266
„ *Venezuela*	195	+ 25	„ *Chile*	208	+ 16
Batteries, other	1,205	+ 889	„ *Colombia*	88	— 59
To Malaya	769	+ 536	„ *Cuba*	468	+ 251
„ *Ceylon*	172	+ 172	„ *Mexico*	468	— 138
„ *Indonesia*	59	+ 7	„ *Venezuela*	228	+ 87
„ *Siam*	116	+ 116	„ *New Zealand*	13	— 33
Radio receiving sets	1,200	— 56	Spark plugs, magnetos, etc.	1,594	+ 741
To Venezuela	319	— 21	*To Australia*	36	+ 24
„ *Mexico*	13	— 54	„ *South Africa*	402	+ 173
„ *Siam*	55	+ 47	„ *Venezuela*	62	— 10
„ *South Africa*	12	+ 12	„ *India*	159	+ 18
„ *Peru*	135	+ 134	„ *Indonesia*	154	+ 140
Radio apparatus, other	2,253	+ 120	„ *Brazil*	66	+ 66
To Brazil	207	+ 16	„ *Mexico*	190	+ 19
„ *United Kingdom*	99	+ 91	Electrical apparatus, n.o.p.	2,698	+ 1,620
„ *South Africa*	31	+ 14	Cooking stoves, elec.	307	+ 66
„ *Mexico*	355	+ 348	*To United Kingdom*	86	+ 41
„ *Venezuela*	101	+ 87	„ *South Africa*	60	+ 18
Dynamos, generators and parts	1,044	+ 646	„ *Irish Republic*	58	+ 10
To South Africa	18	+ 14	Cooking and heating devices, elec.	23	— 51
„ *Pakistan*	15	+ 13	Refrigerators (power)	800	+ 432
„ *Australia*	88	+ 87	*To Colombia*	69	+ 67
„ *Brazil*	643	+ 356	„ *French Africa*	293	+ 179
„ *Cuba*	29	— 6	Vacuum cleaners	38	+ 33
Telegraph and telephone apparatus	875	+ 326	*To Mexico*	18	+ 6
To Brazil	176	+ 138	Domestic washing machines, elec.	2,060	+ 600
„ *Cuba*	15	+ 4	*To United Kingdom*	293	+ 188
Motors and parts	1,229	+ 275	„ *Mexico*	37	— 222
To South Africa	29	+ 18	„ *Venezuela*	43	— 4
„ *Australia*	296	+ 28	„ *Chile*	54	+ 36
„ *New Zealand*	170	+ 57	„ *Brazil*	426	+ 375
„ *Brazil*	137	— 50	Insulated wire	3,049	+ 389
„ *Indonesia*	45	+ 45	*To Mexico*	485	+ 358
„ *United Kingdom*	86	+ 75	„ *United States*	841	— 604
Transformers and parts	2,399	+ 2,014	„ *Venezuela*	893	+ 544
To Brazil	2,332	+ 2,213			

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — MELBOURNE. — 8th October. State Electricity Commission of Victoria. Supply of 6.6 and 22 kV automatic regulating equipment. (C.R.E. 29716/52. Ten/4561.)*

Formosa.—TAIPEI TAIWAN.—24th September. Central Trust of China, United States Aid Division. Power cable. (C.R.E. 29061/52. Ten/4555.)*

India. — NEW DELHI. — 23rd September. Supply of dry and inert cells, dry batteries and sac elements. (C.R.E. 29745/52. Ten/4565.)*

Nottingham.—22nd September. Nottingham and District Technical College Joint Education Committee. Stage 1 of the re-wiring of the Technical College. (See this issue.)

South Africa.—JOHANNESBURG.—18th September. Union Government. Supply of 150,000 tubular glass fuses. (C.R.E. 29697/52. Ten/4564.)* Supply of 210 thermostatic switches. (C.R.E. 29699/52. Ten/4563.)*

PRETORIA.—18th September. Union Tender and Supplies Board. Plugs and sockets for telephone connections. (C.R.E. 29698/52. Ten/4562.)* 2nd October. One private automatic exchange for Defence Headquarters. (C.R.E. 29696/52. Ten/4559.)*

Uruguay.—MONTEVIDEO.—23rd September. Usinas Electricas y Telefonos del Estado. Step-up and step-down transformer substations and interconnecting transmission lines of 110 and 33 kV, with the hydro-electric power station of Rincon del Bonete. (C.R.E. 29513/52. Ten/4549.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

Bath.—City Council. Accepted. Illuminations, Sydney Gardens (£4,598).—Blackmore & Nation.

Finchley.—Highways Committee. Accepted. Relighting on the North Circular Road: Street lighting lanterns and control gear (£3,353).—G.E.C. Lighting columns and the fixing of lanterns, etc. (£4,550).—Concrete Utilities, Ltd.

Hertfordshire.—County Council. Electrical installation at Broom Barnes Infants' School, Stevenage, and Birchwood Avenue Infants' School, Hatfield (£2,250).—A. Tindall & Sons, Enfield.

Lancashire.—County Education Committee. Recommended. Rewiring original building of the M. Marsh College of Physical Education (£2,998).—Engineering Service Installations, Ltd., who are at present engaged on the electrical installations of the extensions to the College.

Rewiring Leigh Central County Secondary Modern School (£1,600).—H. J. Cash & Co., Ltd.

Repairs to electrical installation at Crosby Waterloo Boys' Grammar School (£651).—Fox & Co. (Childwell), Ltd.

Newcastle-on-Tyne. — Regional Hospital Board. Roadway lighting installation at Alnwick Maternity Hospital (£319).—I. & E. Morton, Alnwick. Electrical installation at nurseries at Whitehaven Hospital (£189), and electrical installation at ward annexe (£284).—T. S. Bell & Co., Whitehaven. Electrical installation at villas at Dovenby Hall Hospital (£2,376).—G. Bowman, Ltd., Carlisle.

Southport.—Corporation Lighting Committee. Recommended. Provision and installation of 162 "S.O. Fifty" type lamps in various roads (£8,816) and 75 "S.S. Fifty-one" type lamps (£1,509).—Metropolitan-Vickers Electrical Co., Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Atherstone.—Houses (48) at Polesworth; surveyor, Rural Council offices.

Blackpool.—Twin operating theatre suite, Victoria Hospital; Manchester Regional Hospital Board, 1, North Parade, Manchester, 3.

Bournemouth.—Police headquarters, Madeira Road; W. L. Clowes, borough surveyor.

Brentwood.—Flats (38), Three Arch estate; R. W. Lone, architect, 15, New Square, Lincoln's Inn, W.C.2.

Burton-on-Trent.—Junior mixed school at Winshill; H. B. Chapman, town clerk, Town Hall.

Chichester.—Redevelopment plan for St. Richard's Hospital, with operating theatre block as first phase; South West Metropolitan Regional Hospital Board, 11a, Portland Place, London, W.1.

Colchester.—Crematorium (£30,000); J. S. Orchard, borough surveyor, Town Hall.

Coventry.—Pithead baths at Binley Colliery; N.C.B. Architect's Department, Himley Hall, Dudley, Worcs.

Croydon.—Office block and flats, 26/28, Addiscombe Road; Scottish Union & National Insurance Co., Ltd., Northgate House, Moorgate, E.C.2.

Devizes.—Dwellings (38), Home Farm estate; borough surveyor.

Fifeshire.—Extension to Cameron Hospital, Windygates, for East Regional Hospital Board; J. H. Frew, 6, Cambridge Street, Edinburgh, 8.

Glasgow.—New building at Parkhead for Begg, Cousland & Co., Ltd.

Hospital at Vale of Leven for Department of Health for Scotland; J. Keppie & Henderson, 196, West Regent Street, Glasgow, C.2.

Glenboig.—Police station and houses for Lanark C.C.; W. R. Watt, 34, Albert Street, Motherwell.

Golborne.—Houses (102) for Coal Industries Housing Association; J. C. Prestwich & Sons, architects, Bradshawgate Chambers, Leigh, Lancs.

Great Yarmouth.—Flats and maisonnettes (137) in Middlegate Street reconstruction area; borough architect, 1, Middlegate Street.

Hambledon.—Houses (68), Cranleigh Village, Woodside Road, Chiddingfold, and in Croft Road, Witley; R. J. Garland, clerk to R.D.C., Council Offices, Bury Fields, Guildford.

High Wycombe.—Housing schemes, Berryfields estate, Princes Risborough, and Flackwell Heath No. 2 estate; J. Auton, clerk, 17, High Street.

Hurley (Atherstone).—Research station (£50,000) for Milk Marketing Board; Lanchester & Lodge, architects, Woburn Square, London, W.C.1.

Hyde.—Redevelopment and extension of works; T. Wall & Sons, Ltd., Old Mottram Road.

Keighley.—Houses, Calver Avenue (44), Oakworth (10) and Oxenhope (10); borough architect.

Kirkcaldy.—Flats (128), Dunearn Drive; Scottish Special Housing Association, Ltd., 15, Palmerston Place, Edinburgh.

Lancaster.—Houses (212), Ridge estate, and eight shops with dwellings over, Hala estate; R. M. Middleton, town clerk, Town Hall.

Leeds.—Three-storey public health laboratory at Seacroft Hospital, York Road, for Medical Research Council; W. A. Shee, Secretary to Regional Hospital Board, Park Parade, Harrogate.

London.—Camden Town.—Dwellings (115), Camden High Street; Norman & Dawbarn, architects, 5, Gower Street, W.C.1.

Hampstead.—Flats (32), Kilburn Gate; J. B. F. Cowper, architect, 39, Gordon Square, W.C.1.

North Kensington.—R.C. School, St. Charles' Square; Nicholas & Dixon-Spain, architects, 19, Hanover Square, W.1.

St. Marylebone.—Large hotel on site adjacent to Portman Square, W.1; Major A. Ash, architect, 66, Great Cumberland Place, London, W.1.

Loughborough.—Works extensions; Wm. Hammond & Son, Ltd., Havelock Street.

Lyme Regis.—Dwellings (48), Summerhill Road; borough surveyor.

Malmesbury.—Housing scheme, Corn Gastons site; Edwards & Webster, architects, 10, St. Mary Street, Chippenham.

Middlesbrough.—Nurses' training unit, casualty and outpatients' departments at Hemlington Hospital for the Regional Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne; Board's architect.

Branch library at Thorntree for the T.C.; borough engineer.

Morley.—Factory extensions, Hope Street; Greenwood & Walsh, woollen manufacturers, Peel Street.

Newcastle-under-Lyme.—New works; Metanodic (Engineers), Ltd., 1a, Poole Dam.

North Shields.—Factory additions at Low Lights for North Shields Guano and Oil Co., Ltd.; Hastie D. Burton, Ltd., builders, King Street, North Shields.

Northumberland.—Pithead baths at East Hartford Colliery; J. S. Spooner, architect, N.C.B. Offices, Ashfield Tower, Gosforth.

Nutfield (Redhill).—Adaptations at The Priory to form boarding school for deaf children (£17,500); Surrey county architect, Kingston-on-Thames.

Ossett.—Houses (40), Manor Lane; Harlow & Milner, Ltd., Warrengate, Wakefield.

Petersfield.—Houses (42) at Bramshott; R.D.C. surveyor, The Old College.

Plymouth.—Bungalows for old persons, community centre, etc.; and scheme for 33 flats on sites in Beacon Park; H. J. W. Stirling, city architect, Seymour Road.

Prescot.—Houses (48) on Shaw Lane site; Gornall, Kelly & Partners, architects to U.D.C., 8, Hardshaw Street, St. Helens.

Seaton Burn (Northumberland).—Pithead baths at Seaton Burn Colliery; George Henderson, contractor, East Boldon, Co. Durham.

Southampton.—Twin operating theatres, Royal Hospital; Gutteridge & Gutteridge, architects, 45, Westwood Road.

Southport.—Mental hospital for 1,000 patients; Liverpool Regional Hospital Board, 88, Church Street, Liverpool.

Spennymoor.—Conversion of Whitworth House into a teaching and medical centre; county architect, Court Lane, Durham.

Spilsby.—Houses (112), Hogsthorpe; R.D.C. surveyor, Boston Road.

Stanley (Co. Durham).—Church at South Stanley (£13,000); Cordingley & McIntyre, architects, The College, Durham.

Stourbridge.—Houses (528), Pedmore Fields estate; G. N. Maynard, borough surveyor.

Stretford.—Flats (57), Talbot Road and Chester Road; borough engineer.

Thorne.—Houses (56), South Common estate; T. H. Johnson & Son, architects to R.D.C., 20, Priory Place, Doncaster.

Uxbridge.—Houses (60), Glebe Avenue, Ickenham; H. E. G. Stripp, U.D.C. surveyor, 203, High Street.

Wakefield.—Works extensions; Charles Wensley & Sons, Ltd., Kings Road.

West Bromwich.—Factory and laboratory, Bromford Lane; Roway Metals, Ltd., Oldbury Road.

West Denton.—Church; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

West Hartlepool.—Rebuilding St. Joseph's R.C. school for the E.C.; borough architect.